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ABSTRACT

A learning disability is seen as the outcome of a network of forces that include neurophysical, emotional, familial, organizational, political, social, historical, and technological cases. Options for research and development are based on this integrative view, and both "hard" and "soft" technologies must be considered. "Hard" technology refers to concrete discoveries and inventions such as facts about the brain and microcomputers. "Soft" technology refers to how the technology is used and who uses it. The complex of legislation, private and public organizations, programs, theories, and research are all "soft" technologies. These "soft" inventions provide the social context for "hard" technologies. This case study argues that unless this social context is addressed, the promise that advanced "hard" technology holds for learning-handicapped people might be seriously compromised. (216 references) (Author/EW)

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A learning disability is seen as the outcome of a network of forces that include neurophysiological, emotional, familial, organizational, political, social, historical and technological cases. Options for research and development are based on this integrative view. In this case study, both "hard" and "soft" technologies relevant to the learning disabled are discussed. "Hard" technology refers to concrete discoveries and inventions such as facts about the brain and microcomputers. "Hard" technology is the "what." "Soft" technology refers to how the technology is used and who uses it. The complex of legislation, private and public organizations, programs, theories and research are all "soft" technologies. These "soft" inventions provide the social context for "hard" technologies. This case study argues that unless this social context is addressed, the promise that advanced "hard" technology holds for learning-handicapped people might be seriously compromised.

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Technology and Learning Disabilities

DECEMBER 1983

This case study was performed as a part of OTA's Assessment of

Technology and Handicapped People

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HEALTH TECHNOLOGY CASE STUDY 25:

Technology and Learning Disabilities

DECEMBER 1983

This case study was performed as a part of OTA's Assessment of

Technology and Handicapped People

Prepared under contract for OTA by:
Candis Cousins, M.S., Doctoral Candidate, Wright Institute, Berkeley, Calif.
and
Leonard Duhl, M.D., Professor of Public Health and City Planning
University of California, Berkeley, Calif.

OTA Case Studies are documents containing information on a specific medical technology or area of application that supplements formal OTA assessments. The material is not normally of as immediate policy interest as that in an OTA Report, nor does it present options for Congress to consider.

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Preface

Technology and Learning Disabilities is Case Study 25 in OTA's Health Technology Case Study Series. It was prepared in response to a request by the Senate Finance Committee, Subcommittee on Health and is part of OTA's project on *Technology and Handicapped People*, requested by the House Committee on Energy and Commerce and its Subcommittee on Health and the Environment and the Senate Finance Committee, Subcommittee on Health. A listing of other case studies in the series is included at the end of this preface.

OTA case studies are designed to fulfill two functions. The primary purpose is to provide OTA with specific information that can be used in forming general conclusions regarding broader policy issues. The first 19 cases in the Health Technology Case Study Series, for example, were conducted in conjunction with OTA's overall project on *The Implications of Cost-Effectiveness Analysis of Medical Technology*. By examining the 19 cases as a group and looking for common problems or strengths in the techniques of cost-effectiveness or cost-benefit analysis, OTA was able to better analyze the potential contribution that those techniques might make to the management of medical technology and health care costs and quality.

The second function of the case studies is to provide useful information on the specific technologies covered. The design and the funding levels of most of the case studies are such that they should be read primarily in the context of the associated overall OTA projects. Nevertheless, in many instances, the case studies do represent extensive reviews of the literature on the efficacy, safety, and costs of the specific technologies and as such can stand on their own as a useful contribution to the field.

Case studies are prepared in some instances because they have been specifically requested by congressional committees and in others because they have been selected through an extensive review process involving OTA staff and consultations with the congressional staffs, advisory panel to the associated overall project, the Health Program Advisory Committee, and other experts in various fields. Selection criteria were developed to ensure that case studies provide the following:

- examples of types of technologies by function (preventive, diagnostic, therapeutic, and rehabilitative);
- examples of types of technologies by physical nature (drugs, devices, and procedures);
- examples of technologies in different stages of development and diffusion (new, emerging, and established);
- examples from different areas of medicine (e.g., general medical practice, pediatrics, radiology, and surgery);
- examples addressing medical problems that are important because of their high frequency or significant impacts (e.g., cost);
- examples of technologies with associated high costs either because of high volume (for low-cost technologies) or high individual costs;
- examples that could provide information material relating to the broader policy and methodological issues being examined in the particular overall project; and
- examples with sufficient scientific literature.

Case studies are either prepared by OTA staff, commissioned by OTA and performed under contract by experts (generally in academia), or written by OTA staff on the basis of contractors' papers.

OTA subjects each case study to an extensive review process. Initial drafts of cases are reviewed by OTA staff and by members of the advisory panel to the associated project. For commissioned cases, comments are provided to authors, along with OTA's suggestions for revisions. Subsequent drafts are sent by OTA to numerous experts for review and comment. Each case is seen by at least 30, and sometimes by 80 or more outside reviewers. These reviewers may be from relevant Government agencies, professional societies, consumer and public interest groups, medical practice, and academic medicine. Academicians such as economists, sociologists, decision analysts, biologists, and so forth, as appropriate, also review the cases.

Although cases are not statements of official OTA position, the review process is designed to satisfy OTA's concern of each case study's scientific quality and objectivity. During the various stages of the review and revision process, therefore, OTA encourages, and to the extent possible requires, authors to present balanced information and recognize divergent points of view.

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25	Technology and Learning Disabilities; Candis Cousins and Leonard Duhl (OTA-HCS-25)

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OTA Note

These case studies are authored works commissioned by OTA. Each author is responsible for the conclusions of specific case studies. These cases are not statements of official OTA position. OTA does not make recommendations or endorse particular technologies. During the various stages of review and revision, therefore, OTA encouraged the authors to present balanced information and to recognize divergent points of view. Since the research writing of this case study in early 1981, there has been a technological revolution—in the form of the microcomputer—in the field of learning disabilities. This study covers technological advances up to the microcomputer and, therefore, was completed too early to include it.

Summary

Summary

Current definitions of learning disabilities refer to a set of disorders that affect reading, handwriting, spelling, mathematics, listening, expressive language, and social skills. By definition, learning disabilities are not caused by a lack of intelligence, sensory impairment (like deafness), primary emotional disturbance, or environmental, cultural, or economic disadvantage. This definition thus excludes all commonly accepted impediments to learning except neurological impairment. The theories, treatments, and investigations of the learning disabilities field frequently reflect the exclusionary approach of the definition. Learning disabilities are recognized primarily as school-related problems.

In the last decade, however, a growing number of experts in the field have come to see learning disabilities as arising from an interaction of neurophysiological with psychological, educational, and social factors. The neurophysiological factors are seen as necessary but perhaps not sufficient to explain the nature and prevalence of learning disabilities. Although the precise nature of these neurophysiological factors is yet elusive, the concept of learning disabilities seems to require a neurophysiological component as a sine qua non, setting learning disabilities apart as a group of disorders that merit legislative attention and support.

A systems approach is applied here to learning disabilities. This approach is a comprehensive rather than an exclusionary approach. Thus, a learning disability is seen not simply as a problem in academic learning but as a particular style of thought, performance, and expression that can affect one's entire life. A learning disability is seen not as specific to school settings but as involving the family, the community, the immediate environment, and progressively farther-reaching environments. Rather than being seen as having a single cause, a learning disability is seen as the outcome of a network of forces that include the neurophysiological, emotional, familial, organizational, political, social, historical, and technological. Options for research and development are based on this integrative view.

In this case study, both "hard" and "soft" technologies relevant to the learning disabled are discussed. "Hard" technology refers to concrete discoveries and inventions such as facts about the brain and microcomputers. "Hard" technology is the what. "Soft" technology refers to how the technology is used and who uses it. The complex of legislation, private and public organizations, programs, theories, and research are all "soft" technologies. These "soft" inventions provide the social context for "hard" technologies. This case study argues that unless this social context is addressed, the promise that advanced "hard" technology holds for learning-handicapped people might be seriously compromised.

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Part One

The Field of Learning Disabilities

"There was something wrong with my brain. What had previously been a shadow of suspicion that hovered on the edge of consciousness became certain knowledge the year that I was nine and entered the fourth grade. I seemed to be like other children but I was not like them: I could not learn to read or spell. Throughout my childhood and youth the nature of my disorder remained mysterious. . . . When I was twenty-two it was diagnosed. . . . I was dyslexic."

—Ellen Simpson, psychotherapist and poet, in her Autobiography *Reversals*

"Having made a strenuous effort to understand the symbols he could make nothing of, he [Gustave Flaubert] wept giant tears. . . For a long time he could not understand the elementary connection that made of two letters one syllable, of several syllables a word."

—Caroline Commanville in *Souvenirs Intimes* describing the French novelist Gustave Flaubert

"I remember vividly the pain and mortification I felt as a boy of eight, when I was assigned to read a short passage of scripture at a community vesper service during summer vacation in Maine—and did a thoroughly miserable job of it."

—Nelson Rockefeller in *TV Guide*, October 16, 1976

"I missed [my nurse] terribly. Every day I wrote her—a short, badly written ill-spelled note: writing and spelling were always terribly difficult for me. . . . I was always recognized, though quite kindly, as the "slow one" of the family. . . . It was quite true, and I knew it and accepted it."

—Agatha Christie in *An Autobiography*

"For years I had hidden from parents, sisters, teachers, friends, even my husband, the fact that I can read only a few minutes at a time before becoming confused and exhausted. My problems extend beyond the inability to read well. Although I managed to earn a bachelor's degree and attend graduate school, I can neither recite the alphabet straight through nor do I know the multiplication and division tables. . . . I have difficulty writing down the simplest note. . . "

—Roa Lynn in *Learning Disabilities*

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Part One
The Field of Learning Disabilities

OVERVIEW OF THE FIELD

A large number of competing theories concerning the nature of learning disabilities has left the field with no universally accepted definition. The present legal definition, accepted by most school practitioners, as stated in the Education for All Handicapped Children Act of 1975 (Public Law 94-142), rules out all known causes of learning disorders *except* neurological impairment. The historical roots of the field can be found in the areas of language dysfunction, mental retardation, and perceptual disorder. Recent estimates state that between 4 and 20 percent of the U.S. school age population is learning disabled. Identification and treatment have traditionally been interdisciplinary.

Definition of "Learning Disabilities"

Despite the lack of a universal definition of "learning disabilities," the definition exists in the law. In Public Law 94-142, a learning disability is defined as "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell or do mathematical calculations" (167).

Problems of taxonomy and semantics have impeded defining "learning disabilities" a precise, comprehensive way. In 1968, the National Advisory Committee on Handicapped Children offered a definition of the term that is now widely used. This definition significantly influenced the one that the U.S. Congress used in 1969 in Title VI of Public Law 91-230 and in Public Law 94-142.

Congress further defined the term to exclude "children who have learning problems which are primarily the result of visual, hearing or motor handicaps, of mental retardation, or of environmental, cultural or economic disadvantage." It is not surprising that this definition was greatly criticized by some in the learning disabilities field, a field that boasts scores of different professional and special interest groups.

Whether the Federal definition has helped to standardize the use of the term is questionable. Mercer, Forgone, and Wolking (137) found that the definitions of learning disabilities used by 42 State departments of education were not consistent. Among the terms frequently used interchangeably with "learning disabilities" are the following: dyslexia, hyperactivity, hyperkinetic syndrome, brain dysfunction, brain damage, perceptual-motor dysfunction, visual-motor dysfunction, dyscalculia, aphasia, alexia, developmental learning disability, and others.

The lack of agreement in defining learning disabilities reflects the variety of theories about the nature, and especially about the cause, of such disabilities. Over the years, the explanation of learning disabilities in terms of underlying brain dysfunction has been cautiously replaced with behavioral descriptions. Perhaps defining learning disabilities is difficult because learning disabilities are not a single disorder but a set of disorders. This set of disorders may or may not have a common origin. All of them, however, interfere with learning in the nonretarded population.

Two aspects of the present legal definition that appear problematic are the exclusionary structure of the definition and what is called the "discrepancy" formulation. The definition of learning disabilities as not one of a number of other known impediments to learning (125) has been criticized (174,175). The definition of learning disabilities as discrepancies between actual school performance and intellectual potential (19) has also been criticized (174,177).

Thus, the definition of learning disabilities in Public Law 94-142 is far from definitive or universally accepted. Whether such disabilities are essentially behavioral or physiological is a question not addressed by the legislation. The definition in

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Public Law 94-142 functions primarily as legal groundwork for demanding appropriate schooling for learning-handicapped individuals.

History of the Field: Theories, Terms, and Treatments

"Learning disabilities" is a relatively new term. Coined by Samuel Kirk in 1963, the term has come to function as a label for individuals of normal intelligence, physical intactness, emotional health, adequate instruction, and sufficient motivation who are somehow unable to master basic skills related to school success. Discovery of the learning-disabled population began in the late 19th and early 20th centuries with studies of adults with documented brain injuries who had speech and language difficulties. In the first half of the 20th century, related literature appeared in the areas of vision abnormalities, hyperactivity, postencephalitic behavior, and perceptual abnormalities of children with cerebral palsy. Parallel to this, researchers began differentiating among the formerly uncategorized group of "retarded" students. From efforts at differentiating among the retarded came remedial programs for the learning disabled.

Early Observations of Language and Reading Disorders

Although the term "learning disabilities" is not even two decades old, related phenomena have been observed since the late 1800's. The earliest record of what is now characterized as a learning or reading disorder can be found in the literature on aphasia in adults. Autopsies of adults who suffered the sudden loss of speech and capability to attach meaning to written symbols revealed lesions in these persons left hemispheres.

According to British neurologist MacDonald Critchley, the term "word blindness" was introduced by Kussmaul in 1887 to describe the loss of reading ability. The term "dyslexia" was introduced 10 years later (25) and became that used by the medical community to refer to neurologically based reading disorders.

In 1885, the Scottish ophthamologist Hinshelwood reported cases of visual memory disorders and word blindness in adults. One year later a case was reported of a 14-year-old boy in Britain with "congenital word blindness," described by his schoolmaster as "the smartest lad in school if instruction were entirely oral" (141).

Interest in the causes of reading disorders in individuals of normal intelligence grew in the first quarter of the 20th century. Some, including Fisher (70), proposed that the neuropathological lesions found in the brains of aphasic adults could account for "congenital reading disorders." For others, such as Pipert writing in 1924 (55), the underlying psychological disorders were functional neuromaturational delays rather than anatomical abnormalities.

In the 1930's, Samuel Orton developed a theory that was to become highly influential in shaping the field. Orton (153) proposed that certain reading difficulties were the outcome of the incomplete dominance of one hemisphere of the brain over the other. His theories were based on the observations of children with learning difficulties who wrote or read written symbols in a backwards manner. His term "strephosymbolia," meaning "twisted symbols," referred to the misperceptions of written symbols. Ann Gillingham (84), a student of Orton, based a remedial system on his neurological theories. Although Orton's theories still remain to be definitively proved or disproved, Gillingham's teaching system has been successful in a large number of cases, at least according to anecdotal evidence from practitioners.

Gillingham's application of neurological theories to education was among the first of such attempts in the field. As in later efforts, the links between the theory and the treatment were tenuous. It is quite common in the learning disabilities field for a certain treatment to work with a given child without practitioners' knowing why. Is the successful treatment "proof" that the neurological theory is correct? Or, has the child improved because of other unrecognized factors? These questions, difficult to answer in any field of treatment, have been met with few outcome studies in the field of learning disabilities.

An interest in the role of vision in learning disorders developed in the early part of the 20th century. Over the years, an extensive literature has suggested that problems of vision do not play a primary role in learning disabilities (65,153). In the last two decades, a substantial literature has developed on binocularity and its association to learning disabilities. Eye problems appear to exacerbate existent learning difficulties as well as complicate the process of compensating for them (213).

Early Observations of Hyperactivity

G. F. Still, an English pediatrician, observed two different groups of hyperactive children. One group was described as being hyperactive because of "defects in moral control," the other Still presumed to have brain damage or brain lesions (195).

The connection between behavioral abnormalities and cerebral damage was given further support by clinical studies in 1918 of individuals who had survived the major epidemic of von Economo's encephalitis. These adults showed hyperactivity, distractibility and attention disorders, irritability, and impulsivity. In 1911, a group of children who had also survived the epidemic had also been found to have similar symptoms (123).

Kurt Goldstein's studies of World War I soldiers who had survived serious head injuries gave additional support to the hypothesized connection between hyperactive behavior and brain dysfunction. These men showed perseverative behavior, perceptual confusions, and significant disorganization (89,90).

In 1937, Benzedrine® was reported to have a positive effect on the behavior of emotionally disturbed children in a residential treatment center (30). Their interest in school work increased, their work habits improved, and their disruptive behavior declined. This early report of drug treatment did not have great influence. At that time, it was the custom to dismiss seriously disruptive students rather than to medicate them. It was not until the 1960's, when medical journals reported the effects of stimulant drugs on hyperactive children, that such treatment became widespread in this country.

Observations of Learning and Behavior Disorders in the 1940's and 1950's

In the early 20th century, much of the theorizing about brain-behavior relationships was based on autopsies and on the behavior of individuals with well-documented cerebral injuries. It is interesting to note that theories about the handicap called "learning disabilities" were not based on such concrete, empirical evidence. Brain damage or dysfunction was characteristically inferred in those with learning disabilities because of their behavioral similarities to those with documented brain insults or because no other known impediment to learning could be invoked. Gesell and Amatruda (81) were among the first to postulate the existence of brain lesions that couldn't be documented. In 1951, Lilienfeld and Parkhurst wrote of significant, but undocumented brain injury in early life that could result in learning or behavior disorders. In the 1970's, some of the relevant literature implied that early brain damage might explain certain behavior and learning problems. A more comprehensive explanation was also advanced about the interaction between biologically vulnerable constitutions and social-environmental factors (176,179,207).

General Trends in the Study of Child Development: Behaviorism, Psychoanalysis, and Piaget

In 1928, John Watson wrote that, as far as human development was concerned, "there is nothing from within to develop." This statement was typical of the original behaviorist stand, which portrayed the child as passively molded by the environment. This extreme stand on the lack of inborn predispositions contents with the contributions of psychoanalytic literature. Beginning in the 1920's, psychoanalytic writings emphasized not neurological constitution but rather the impact of emotional conflict on the ability to learn information and on the ability to separate from the parent to go to school (74,97,159).

Both psychodynamic thinking and behaviorism influenced the pediatricians of the day (126). Pediatric textbooks and journals tended to give far more weight to social-environmental and emotional factors as causes of learning disorders than did the literature of education. For example, in 1954, *Nelson's Textbook of Pediatrics* portrayed the breakdown of causes for reading problems as 75 percent personality disturbances, 10 percent poor instruction, 2 to 3 percent neurogenic causes, and the remainder a mixture of causes.

The concept of abnormality, of course, is derived from the concept of what is normal. The Swiss epistemologist Jean Piaget had an immeasurable impact on what educators and psychologists considered normal in the conceptual development of children. Piaget wrote that the way children acquire knowledge evolves systematically in predictable stages. His ideas of conceptual development in children have been met in this country with growing enthusiasm since the early 1960's. Despite the stern and elegant disclaimers from Piaget himself that his theories are not intended as the basis for either teaching programs or assessment plans, special education practitioners joined practitioners in regular education in diagnosing and planning for children in accordance with Piaget's observations and theory of normative development.

The Study of Mental Retardation as Ancestor to the Learning Disabilities Field

Until the 1960's, the education of mentally retarded people was almost synonymous with the term "special education." The number of mentally retarded children identified and treated between the 1920's and the 1970's grew rapidly. Similar growth has been seen in the identification and treatment of the learning disabled between the 1960's and the present. Furthermore, concern for the learning disabled and other handicapped learners has, at least for the present, far surpassed concern for the mentally retarded. Sarason (181) states that "In the case of Public Law 94-142, the problems in our schools that seemed to need correction did not primarily center around mental retardation." Sarason suggests that it is not that legislators and the public are not concerned with the mentally retarded, "but rather in the process of implementing the law, schools would tend to give greater attention to other kinds of children."

Thus, the concept of being a special education student while not being mentally retarded, blind, or deaf is not even two decades old. "Learning disabilities" were of course never considered by Binet and Simon when they began in the early 1900's to develop an instrument to differentiate between children who were "poorly motivated" and "mentally retarded" or "inadequately taught." Distinguishing the various degrees and types of mental retardation was at that time far from sophisticated. In addressing the National Education Association in 1910, Henry Goddard stated that the "subnormal" population could be divided into two groups: the "temporarily subnormal whose backwardness is due to sickness, physical impairment or unfavorable environment" and the "permanently" subnormal whose development was arrested before the age of 3 (86).

The Professional Evaluation of Learning Disabilities as Rooted in Complex Kinds of "Brain Damage"

It was not until the important work of Werner and Strauss in the 1930's and 1940's that a more systematic analysis of the learning strengths and weaknesses of "backward" children was offered. Werner and Strauss (208) studied a group of adults of normal intelligence with head traumas, who were earlier studied by Kurt Goldstein, and found that common patterns of behavior were frequently correlated to histories indicating brain injury. Thus, they introduced the category of "brain-injured children." Strauss and Lehtinen (196) speculated that "organic impairment," from brain injury or disease before, during, or after birth, caused disturbances in "perception, thinking or emotional behavior." The study of learning disabilities in the United States is often traced to this publication. The suggestions of Strauss and Lehtinen for classroom instruction, based on the analysis of learning strengths and weaknesses, greatly influenced the field of special education.

The work of Werner and Strauss was further developed by Dolphin and William Cruikshank in the 1950's. Cruikshank attempted to apply their findings to children with normal intelligence and to children with cerebral palsy. In these populations Cruikshank also found evidence of perceptual, conceptual, and visual-motor abnormalities (61). Educational strategies for the "brain-injured child" were further modified. This work was important in establishing the idea of learning disabilities as a problem in learning that can be modified by systematic diagnosis and teaching. The impairment was thus judged "exogenous," one not owing to an inherited pattern or to genetically determined features of the brain but rather to injury or disease occurring outside the genetic structure (125).

Remediation Models Based on Theories of Neurological Impairment

The predominant models of remediation in the field have been based on theories of neurological impairment. In the 1960's, Kephart (110) introduced the "perceptual motor theory," Getman (83) the "visuomotor theory," and Barsch (18) the "movigenic theory." All were concerned with what is called "perceptual-motor" and "sensory-motor" development.

In the 1960's and 1970's, Ayres developed the "sensory integrative therapy," which suggested that higher cortical tasks, such as reading, may be impeded by dysfunctions or incomplete development in the lower brain. The therapy consists of stimulating the lower brain by spinning, rubbing, swinging, and making other movements (12,13).

In the 1960's, Frostig developed systematic methods of diagnosis and remediation of visual-perceptual skills (75,76) as one part of a comprehensive psychoeducational approach.

Yet another kind of remediation takes a language approach. Among the more important leaders in this part of the field are deHirsch (55,56), Myklebust (107,144), and Kirk (114). Kirk has particular historical importance: he coined the term "learning disabilities" in a speech to a group of parents whose children had been labeled "perceptually impaired," "hyperkinetic," and "brain injured." Kirk introduced the term in April 1963, and by February of the following year the group of parents he had addressed went on to organize the Association for Children with Learning Disabilities (ACLD). Kirk also developed the Illinois Test of Psycholinguistic Abilities (ITPA), one of the most widely used instruments to diagnose learning disabilities in the 1970's.

Controversial Treatments

No treatment in the field has been met with universal acceptance. Those that have inspired the greatest controversy have tended to be those involving the medical community. Doman and Delacato (57,62) developed a "patterning" theory of neurological development. The corresponding treatment, widely publicized in its early days as a sort of miracle cure, was designed to enhance normal neurological development in the brain injured, the mentally retarded, and the reading disabled. Certain motor activities were prescribed to remediate neurological organization and thereby to prevent or cure learning disorders. The lack of supportive research for this treatment and the questionable neurological theory behind it drew harsh criticism from the American Academy of Pediatrics (5) and the American Academy of Cerebral Palsy (4).

The controversy over the use of drugs for hyperactivity that took place in the 1960's was followed by more controversy in the 1970's, this time over Feingold's association of hyperactivity with food additives (69). The Feingold approach concerning food additives was adopted by many parents, who thought that learning disabilities and hyperactivity were synonymous. Although the populations overlap, not all hyperactive children are learning-disabled and not all learning-disabled children are hyperactive.

Theories of Remediation: Compensation or Cure?

In a field where no intervention has proved effective for all children, yet where dramatic cures are not infrequently reported in the mass media, outcome studies are particularly important to objectively choose among many treatments. One of the most important issues concerning remediation is whether learning disabilities are conditions that can only be compensated for or whether they are conditions that can actually be cured. Those who argue that they can be cured, such as Ayres or Delacato, frequently advocate some form of motor therapy. Those who argue that they can only be compensated for believe that intervention should focus on the development of basic skills, learning styles, and cognitive abilities related to academic success. Rather than attempting to modify underlying neurological weaknesses, the latter approach attempts to organize learning strengths to compensate for learning weaknesses. Most practitioners adopt this approach, believing that learning disabilities can be effectively ameliorated but not "cured." There are many parents who, quite understandably, hope that they can be "cured." Future research may clarify the issue.

Prevalence of Learning Disabilities

Methodological problems characterize surveys of the incidence of learning disabilities in this country. Recent estimates state that between 4 and 20 percent of the school population is learning disabled. Initial studies indicate an extremely high number of juvenile delinquents are learning disabled. Clinical experience as well as recent genetic research indicated a strong genetic component in learning disabilities. Although the prevalence is far higher in males, the disorder does not appear to be specific to race or socioeconomic class. High prevalence has been correlated to use of prenatal drugs and to living in urban areas.

Estimates of the prevalence of learning disabilities in the United States vary widely. This variation is not surprising, given the lack of consensus in the field about the nature of learning disabilities. The lack of agreement of course makes identification and sampling problematic. Most estimates of the prevalence of learning disabilities fall between 3 and 15 percent, although some go as high as 35 percent of the school age population (130).

Among formulators of public policy, learning disorders are often referred to as "high-incidence/low-severity" handicaps of children (126). Such disorders have been estimated to occur in 4 to 20 percent of the school age population. Learning disorders occur in males far more often than in females. Some say that the ratio of males to females is 6 and (or) 8 to 1 (139), others that the occurrence in males is 3 to 10 times that in females (40).

Learning disorders are contrasted to "low-incidence/high-severity" handicaps, which include multiple or major handicapping conditions like blindness, mental retardation, and severe hearing impairment (126).

Learning Disabilities and Juvenile Delinquency

A 1976 report of the Office of Juvenile Justice and Delinquency Prevention recommended that vigorous incidence studies be conducted to clarify the connection between learning disabilities and juvenile delinquency. By 1978, studies to be conducted by the Law Enforcement Assistance Administration were proposed in Phoenix, Baltimore, and Indianapolis. Grants for this research were awarded to Creighton University in Omaha and to ACLD.

In 1977, the U.S. General Accounting Office commissioned a survey of juvenile delinquents in Connecticut and Virginia and found that 26 percent of those delinquents had "primary learning disorders" or learning disabilities. The report concluded that the figures supported results in Colorado (where 90 percent of adjudicated delinquents were found to have learning disabilities) and in Rhode Island (where 70 percent were) (130).

Hypotheses About the Epidemiology of Learning Disabilities

Learning disabilities tend to cluster in families. It is not uncommon, for example, to uncover visual-motor difficulties in three generations of a given family. Diagnosticians specialized in learning disabilities routinely ask if there is a history of learning difficulties in the family. Anecdotal reports by clinicians indicate that the parents of learning-disabled children receiving remediation "turn themselves in" to receive help in reading or writing along with their children.

Medical World News recently reported that individuals with dyslexia appear to have some abnormality of genes on chromosome 15. This study by geneticists at the University of Miami corroborated a 1979 report of abnormal cell structures in the language function areas of dyslexics (77).

Studies of families and twins have not yet exploited the recent advances in chromosome analysis.

Some postulate that the increasing incidence of learning disabilities can be attributed in part to the drugs administered to pregnant women. A Collaborative Perinatal Project has found evidence suggesting that commonly used obstetric medications may have long-lasting, harmful effects on children born to medicated mothers. This study of 50,000 children was overseen by the National Institutes of Health in the 1950's. The behavior and attention span of the children of medicated mothers were affected until the children were 7 years of age. The children who appeared to have pronounced defects in the areas of cognitive function and gross motor ability were born to mothers who had received the largest doses of the strongest drugs. Particularly dangerous effects were attributed to inhalant anesthetics (116).

Learning disabilities may be more common in children of low socioeconomic status, perhaps because of poor nutrition, birth trauma, or poor perinatal health care. It may be that learning disabilities are culturally transmitted: certain learned skills may serve well only in nonacademic areas. Another possible explanation of learning disabilities is that subtle abnormalities of brain functioning, which may never result in learning difficulties in children with supportive environments, block learning in children with stress-ridden lives.

The reports of famous—and sometimes quite wealthy—people who realize that they were dyslexic children are now familiar to all of us. Among these people are Nelson Rockefeller (and other members of his family), W. B. Yeats, and Gustave Flaubert. *Reversals* (190) is the autobiography of a woman poet who is dyslexic. Such accounts contribute to the understanding that dyslexia or learning disabilities can occur in individuals of talent, intelligence, and privilege.

Prevalence of Reading Disabilities in Other Countries

One of the most highly respected studies of reading disabilities was conducted in Britain in 1975. It compared children in London and on the Isle of Wight (24). This study, found that the incidence of such disabilities was higher in males, by a ratio of 3.5 to 1. It also found a higher incidence in urban areas. Specific reading retardation occurred in about 10 percent of London schoolboys and in only 4 percent of schoolboys on the rural Isle of Wight. The investigators concluded that the study supports the belief that reading disabilities are determined to an appreciable extent by environmental factors.

Despite methodological problems, studies of the prevalence of reading disabilities in several European countries are quite consistent. In Canada, France, Denmark, and Britain, estimates of reading disabilities are about 8 percent (183).

Characteristics of Learning-Disabled Individuals

Characteristic of the learning disabled most often mentioned in the literature include the following: 1) inability to sustain attention, 2) low self-esteem, and 3) low academic performance. Perceptual deficit is the characteristic most commonly mentioned by practitioners. Although the perceptual deficit hypothesis has been repeatedly challenged over the years, it remains a widespread notion underlying both diagnostic and remedial work.

It is generally agreed that learning-handicapped people appear to be healthy individuals with average or higher intelligence. Learning-disabled individuals are not identifiable by clear-cut neurological signs like paralysis, tissue pathology, or abnormal blood chemistry. Rather, such individuals are characterized by difficulties in performing certain learned tasks involving reading, speaking, listening, writing, calculating, spatial orientation, or task performance. Learning disabilities have been associated with signs suggestive of neurological dysfunction: clumsiness, abnormal distractibility, and increased frequency of seizure disorders. The connection of these "suggestive signs" to underlying organic disorders is poorly understood (130,174).

Learning disabilities encompass many characteristics, no single one of which is found in all identified individuals. Such disabilities are recognized as problems in performance, attitude, and behavior. It has been said that if 100 children with learning disabilities were tested, 30 to 40 different profiles might result. Learning disabilities can take many forms, for such disabilities relate to receiving, processing, and producing information (189).

A growing number of researchers in the field state that the one characteristic common to the learning-disabled population is difficulty in focusing and maintaining attention (163,174). Learning disabilities have been associated with certain emotional attributes. Low self-esteem, for example, is commonly observed by practitioners and described in the literature. Dyslexic children from families who have some understanding of the disorder seem to have higher self-esteem than dyslexic children from uninformed families (173). Immaturity and emotional problems are also common in the learning-disabled population. A recent survey has indicated that only 4 percent of the children referred for treatment of learning disabilities displayed average or better emotional adjustment (88,163). Significant differences have been found in the effectiveness of communication in families with disabled learners (160).

Perceptual deficit is perhaps the characteristic of the learning disabled most frequently mentioned by practitioners. Research conducted over the past 10 years, however, has challenged this characterization. The predominant instructional model in special education, which is based on the idea of perceptual deficit, is "differential diagnosis/prescriptive teaching" (71). The assumptions of this model have been criticized, the test instruments for measuring perceptual attributes have been shown unreliable and invalid in many cases (11,47), and the relation between perceptual skills and academic achievement has been found to be tenuous (94).

Other characteristics cited in the literature include problems in motor coordination (12), irregular eye movements (64,82), short memory (204), certain cognitive processes (72), and linguistic impairment (149,201,209).

Identification of Learning Disabilities

The most common method of identifying learning disabilities in school settings has been interdisciplinary, but has relied on some of the assumptions and language of medicine. The medical model has been recently challenged. The regulations for the Education to All Handicapped Children Act of 1975 state that a multidisciplinary team must evaluate a child suspected of a specific learning disability.

The Interdisciplinary Model Most Used in School Settings

The most common method of identifying learning disabilities in school settings has been interdisciplinary, involving professionals from education, psychology, speech, and language. Despite this fact, until recently the model itself has relied on the assumptions and language of the disease model of medicine (52). Professionals from medicine, psychology, and education have recently suggested that a departure should be made from this model. They proposed to analyze learning strengths and weaknesses and the supportive features of settings and to modify any medical jargon used when communicating across interdisciplinary lines or with parents (126).

The regulations of the Education for All Handicapped Children Act of 1975 (Public Law 94-142) state that a multidisciplinary team must evaluate a child suspected of having a specific learning disability. The team should include these members: 1) the child's regular teacher, 2) at least one person other than the child's regular teacher who is qualified to conduct diagnostic examinations of children, and 3) one person other than the regular teacher to observe the child's academic performance in the regular classroom. The regulations specify that identification of learning disabilities should be based on whether children show a severe discrepancy between their achievement and their ability. The report of the evaluation is also supposed to mention any environmental, cultural, or economic disadvantage.

The Concept of "Dysfunction" Rather Than Disease

Levine, et al. (126), recently proposed that learning disabilities be considered "a clinical phenomenon in which performance is impaired on the basis of characteristics that do not fit the traditional model of organic or emotional factors." Rather, the individual is thought to have developed a particular learning style that is maladaptive to a particular educational setting.

The Process of Identification

In the school setting, the sequence of events leading to the evaluation of a student for learning disabilities is usually the following:

1. the student is not performing as expected in one or more areas of school learning;
2. the low academic performance continues and does not seem to respond to the teaching provided in the classroom;
3. possible causes for the academic problem (primary emotional disturbance, physical disability, sensory impairment such as poor vision or hearing, mental retardation, economic or cultural disadvantage) are evaluated and eliminated;
4. a specialist (e.g., a school psychologist or learning disabilities specialist) conducts diagnostic tests using standardized measures of general intelligence and cognitive abilities required for academic work; and
5. if the child is identified as learning disabled, a remediation strategy is prescribed.

The Utility of the Neurological Examination

There is widespread misunderstanding about the function of the neurological exam in action. Professionals, parents, and school personnel commonly believe that this examination provides a definitive diagnosis. Actually, no single medical sign or symptom is a reliable diagnostic sign for learning disabilities. Even the use of sophisticated medical procedures like the electroencephalogram and the dichotic listening exam cannot deliver a definitive diagnosis. The neurological examination may clarify the status of an individual suspected of having learning disabilities, but it cannot definitively answer whether the observed problem in learning is "organic" or "functional." The routine neurological exam can uncover abnormalities of the central nervous system. In most cases, however, it reveals no precise pathology. The examination for "suggestive signs" or minor neurological dysfunctions may indicate developmental delays (126). The relationship of these signs to learning disabilities, however, has still not been established. Very few children referred for evaluation of learning disabilities are actually neurologically examined.

Standardized Tests, Informal Testing, and Observations

The assessment process usually includes an informal classroom observation of the student, an interview with the parents, and administering tests for hearing and vision and those for general intelligence such as the Stanford-Binet Intelligence Test or the Wechsler Intelligence Scale for Children (WISC-R). If the student scores below 80 on an intelligence test, academic difficulties may be attributed to mental retardation. Usually students are not identified as learning disabled if their IQ scores are outside the normal range (8).

Diagnostic testing is usually believed to determine the precise area of difficulty along with patterns of cognitive strengths and weaknesses. The reading process is broken into underlying components by such commonly used tests as the Spache Diagnostic Reading Scales (193) and the Gates McKillop Reading Diagnostic Test (79). During the 1970's, the Illinois Test of Psycholinguistic Abilities (115) was commonly used to assess underlying linguistic skills.

Recently, alternatives to standardized testing have been proposed, e.g., the daily monitoring of classroom work (140). Interviews with parents are commonly regarded as useful for learning about the student's school and developmental history.

The Legislative Mandate To Identify Children With Handicaps

Profound changes in identification procedures began with the passage of Public Law 94-142. Public Law 94-142 specifies that States applying for grants cannot identify over 12 percent of all children (between ages 5 to 17) in the State as handicapped. It is not yet clear how realistic this ceiling is and whether it might increase or diminish the number of handicapped children identified.

The regulations specify that all children with handicaps are entitled to an interdisciplinary evaluation. An independent evaluation or second opinion may be obtained. Parents must be notified and involved in the evaluation process. There are provisions for identification programs for individuals from 3 to 21, except where State law limits the maximum age to 18. All testing is supposed to be nondiscriminatory of the individual's linguistic or cultural background and must be administered in the child's native tongue. There is often disagreement, however, over what constitutes "nondiscriminatory" testing.

Evaluation has always been an expensive process and is also a labor-intensive one. Specialists must be paid not only to evaluate the individual but also to meet with each other. These costs must now be borne by the local education districts.

Physicians and other health professionals have been wary of the effect of Public Law 94-142. The law does not specify the inclusion of physicians on the interdisciplinary teams, but instead leaves it up to local education agencies to seek medical assistance if they desire. Health professionals are apparently concerned that the law does not assign a central role to the medical aspect of identification. There is also the concern that physicians will be called on by parents and schools for definitive diagnoses that they cannot provide through diagnostic tools of adequate precision and predictive value. Satisfactory communication between medicine and education is assumed by the law, which provides no guidelines or support for such communication.

School personnel are also concerned about the lack of role definition. A number of articles, written with thinly disguised disciplinary chauvinism, decry either the underuse or the overlapping functions of school professionals. Reading specialists and learning disabilities specialists have been noted to show territorial conflicts (95). Other concerns of school personnel include the demands made on them to evaluate children and write reports rather than to actually teach. Some see the interdisciplinary identification process as one taking funds that might instead be used for teacher salaries or educational materials (130).

Thus, the time and effort spent to comply with Public Law 94-142 may compete with functioning in accordance with the highest professional standards. Furthermore, it may lead school professionals to be increasingly concerned with job boundaries rather than with providing excellent service.

Early Identification of Learning Disabilities (in Children 2 to 6 Years of Age)

The recent increase in use of screening tests for learning disabilities has been attributed to the legislative mandate to identify children with handicaps, the biomedical research on "high-risk" children, the government-supported programs for young children, and the increasing concern over children's failure in school (180). Because young children have had limited or no exposure to reading or writing, the identification of those with learning disabilities is quite problematic.

Some of the more commonly used early screening tests are the Anton Brenner Developmental Gestalt Test of School Readiness, the Boehm Test of Basic Concepts, the Denver Developmental Screening Test, and the Jansky Screening Index. The potential for misuse of these and other early screening tests has been noted. Rather than being used as tools for systematic observation, they are frequently used to isolate disabilities erroneously, to define IQs falsely, and to assign diagnostic labels. In addition, these screening tests have been described as having limited value in training professionals. The use of these tests has been said to be no substitute for the observations of experienced, sensitive teachers who are routinely able to identify children at risk (180). A vast number of early screening tests in local schools are observational tools developed by teachers.

Intervention

Intervention on the part of the public schools was profoundly changed with the passage of Public Law 94-142, which determined that all handicapped children were legally entitled to a "free appropriate" education. Private schools and clinics also serve learning-disabled individuals, sometimes with tuition support from the public school districts. The adult learning disabled are just now being identified in appreciable numbers. State/Federal Vocational Rehabilitation as well as the community and junior college system are existing publicly funded structures that serve the learning-disabled adult.

Intervention by the Public Schools by Legislative Mandate

With the passage of Public Law 94-142, responsibility for treatment was shifted from the private to the public sector. In the 8 years since the passage of the bill, public schools across the country have developed a range of programs to identify and treat learning-disabled children. Previously, private clinics and private remedial teachers had provided the lion's share of treatment. Much of this treatment could only be had by the well-to-do.

Public Law 94-142 mandates that the best educational setting for the handicapped is one "least restrictive." The law's concern about integrating the handicapped into the "mainstream" of school life (although the word "mainstream" is not used in the legislation itself) can be understood in the context of a history of litigation for the rights of the mentally retarded. Landmark cases established that a lack of financial resources is not a sufficient reason for a school district or agency to deny a handicapped individual a "free appropriate education" (*The Pennsylvania Association for Retarded Children* v. *Pennsylvania; Mills* v. *Board of Education*).

In theory, integrating handicapped children with other groups provides them with the quality of life that is inherent in taking part rather than living in relative isolation. In school situations, such integration would consist of the children spending as much time as possible in the regular classroom without sacrificing the fulfillment of any social or educational need.

An individualized education program (IEP) is required for all children identified as in need of special education. Public Law 94-142 stipulates that the basic requirements of the IEP are statements of plans for the following: 1) assessment, 2) goals and objectives of the child's education, and 3) evaluation and review procedures. The IEP process is designed to facilitate communication between parents and school personnel so that they cooperatively design the child's program. The law's delineation of due process provides means for resolving any differences concerning the child's needs. Parents have the right to request a hearing.

The written IEP also serves as a commitment of the resources necessary for the handicapped child to benefit from special education and related services. The IEP is to serve also as a "management tool . . . to ensure special education and related services," a "compliance monitoring document" for Public Law 94-142, and an "evaluation device" (68).

Private Schools

Although small private schools, unless especially designed for the special education population, at first turned away learning-disabled children, they have now emerged as an alternative to public schools for these children (3). The number of private special education schools for learning-disabled children has increased. Paradoxically, the need for the alternative of private education was expressed by parents with increased urgency after the passage of the law for handicapped children. The turn to private schooling for children with learning disabilities has not yet been extensively studied, but may be explained either by the dissatisfaction of parents with the quality of instruction in mainstreamed classrooms compared to that in special education classrooms or by the legal stipulation that school districts must pay for private schooling if the parents and school personnel have agreed that the school district cannot provide an "appropriate" education.

Some school districts now pay the tuition for learning-disabled children at private schools. The law has perhaps been beneficial for the private sector although it was designed to increase the effectiveness of the public sector. In the last 2 or 3 years, however, the reduction of Federal and State funds to schools has meant less financial support for the private sector to serve the learning disabled.

Learning-Disabled Adults

Learning-disabled adults are offered very few government-supported interventions. Recommendations to ameliorate this situation have recently been submitted by the Task Force on Learning Disabilities, based in the Rehabilitation Services

Administration (168). The purpose of the Rehabilitation Services Administration 1980 task force is to reexamine issues associated with the learning disabled in terms of program eligibility, diagnostic procedures, and the provision of rehabilitation services by the State/Federal Vocational Rehabilitation program.

The task force found a wide range of policies and practices for the learning disabled in different State vocational rehabilitation programs. Until recently, to qualify for vocational rehabilitation services an individual had to provide evidence that his or her learning disability had a physiological cause. Since 1980, however, learning disabilities have been considered a "specific developmental disorder" in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM III). Thus, a learning-disabled individual meets eligibility requirements by having a "medically recognizable physical or mental disability" (168).

The task force also reported that, although no well-developed literature describes the vocational implications of learning disabilities, there appears to be a considerable amount of practical wisdom about the topic among vocational rehabilitation practitioners who have worked with the learning-disabled adult population. The task force reported that large numbers of potentially eligible citizens are not receiving vocational rehabilitation services.

Community and Junior Colleges

The adult identified as learning disabled is relatively new for those in the field of postsecondary education. The demand for college instruction for learning-disabled adults has stimulated a reevaluation of programs and services in all aspects of postsecondary education (155).

The system of junior and community colleges has been described as an educational structure highly appropriate for the learning-disabled adult, offering counseling and guidance as well as coursework (130).

Although there are few special postsecondary programs for learning-disabled adults across the country (50), the California community colleges seem to provide an exception. A recent survey of these 106 community colleges found that 75 percent operate formal programs for learning-disabled adult students. In addition, another 12 percent provide informal services for such students. Under the label of LDA (learning-disabled average), these students can pursue an Associate of Arts degree, a vocational certificate, or training. These educational programs are free to California residents (155).

HARD AND SOFT TECHNOLOGIES OF LEARNING DISABILITIES

The technology of brain and biochemical research has seen considerable development in the last decade, particularly with regard to localizing brain function.

The most important recent development in soft technology is legislation for the handicapped. The delivery of services promised in the new legislation is problematic. Financial problems are reported by school districts attempting to meet compliance regulations.

Hard Technologies*

The technologies of brain research and biochemical research have developed fast in the last decade and have present suggestive findings about the possible physiological bases of learning dis-

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*The use of computers and electronics has greatly increased in the field's research and remediation since this report was written in 1981. *The Journal of Learning Disabilities*, beginning with the June/July issue in 1982, is an excellent source of information about computers and learning disabilities.

abilities. Biochemical studies, such as those on environmental contaminants, the effects of drugs and food additives on hyperactivity, and the effects of massive doses of vitamins have also been reported recently in the literature. The use of computers has been proposed for gathering data on brain function in "neurometrics," for storage and retrieval of educational and clinical data in treatment settings, and for teaching systems. The technology of intervention includes microcomputer programs especially designed for the learning styles and needs of the learning-disabled student Hand-held calculators are now available to consumers, as well as data-processing systems, which could supplement learning disabilities programs. Electronic technology presents the potential of providing different auditory and visual information. It may even someday replace written symbols as a means of communication.

Neurophysiological Research

Identification and treatment of learning disabilities has traditionally been based on neurophysiological research. This research focuses on how the brain processes information. A number of hypotheses based on neurophysiological research have been advanced; none are universally accepted. Geschwind (80) has observed that only within the last 25 years have the problems of neurophysiological research begun to be clarified and that researchers have begun to realize that a definitive delineation of the issues is still not in sight.

As indicated above, one longstanding explanation of learning disabilities, put forth by Orton (153), is abnormal cerebral dominance or asymmetry of the cerebral hemispheres. Testing this hypothesis has become possible only in the last 13 or 14 years with the development of a number of experimental techniques. Using visual, auditory, or tactile stimulation, researchers have attempted to uncover the connection between reading and the hemispheres of the brain (112,212). The results of these studies, however, have shown no systematic differences between normal readers and dyslexics in terms of hemispheric functioning—both groups appear to use the left hemisphere for reading. The differences between normal readers and dyslexics might lie in the way the right hemisphere is coordinated with the left in reading. In dyslexic individuals, reading and other verbal tasks involve the left hemisphere; in normal readers, the same is true. Reading also involves spatial skills, however, which in normal individuals are associated with the right hemisphere, but which in dyslexics may be associated with both hemispheres. In a dyslexic person, the involvement of both hemispheres in processing spatial information may interfere with the left hemisphere's processing of verbal information. That is, the problem may be one of coordination rather than of location of brain function (211).

Differences in hemispheric functioning might also be associated with gender. Witelson (212) suggests that the right hemispheres of girls are specialized for specific functions considerably later than are those of boys. This suggests that the brains of girls may remain more flexible in the functions they can perform. Thus, "language functions may transfer more readily to the right hemisphere in females than in males following early damage to the left hemisphere."

The idea that each human behavior originates in a specific area of the brain, called "localization of cerebral functioning," is an idea older than Plato. One of its proponents in the 19th century was the French surgeon Broca. He observed that a number of his patients had exhibited speech defects following injury to or disease in the left hemisphere, more specifically, after injuries to the area above and in front of the left ear (130).

Wada much later developed a technique for localizing brain function that has been used extensively by the researcher Milner. Amobarbital®, a fast-acting anesthetic, is injected into one of the carotid arteries to disable certain parts of the brain. Milner (138) found that most people, whether left or right handed, could speak when the right side of the brain is anesthetized. However, 7 percent of his right-handed subjects and

13 percent of his left-handed subjects could not. A small percentage of the subjects (1 percent of those right handed and 10 percent of those left handed) could speak with either half of the brain anesthetized.

"Neurometrics," a new research methodology for the organization of data on brain function, was introduced in 1977. Data from brainwave recordings and sensory-evoked electrical responses are gathered and analyzed by computer. These methods yield insights into brain function that are not apparent from looking at an EEG (electroencephalogram) alone. Neurometrics uses mathematical techniques known as "numerical taxonomy" and requires "a new automated, computer-centered technology" (106). This new technology was used in a research project to discriminate between a group of normal children and children identified as learning disabled. The researchers concluded the following: "Neurometric EEG measures not only discriminated between normal and learning-disabled children better . . . than the psychometric measures, but reflected processes more intimately related to brain function" (106).

Physiological research in the field also includes the brain autopsies of diagnosed dyslexics. As there is great variability in normal brains, the investigation of a large number of dyslexic brains will be required to achieve significant results. Witelson and Pallie at McMaster University in Canada are attempting to obtain the consent of terminally ill individuals with learning disabilities to donate their brains for research and to take a large number of psychometric tests while they are still alive (130). The Orton Society is planning a similar project. The society is also attempting to standardize methods of brain dissection to expedite the comparison of findings (130). The state of the art, however, is such that in these autopsies researchers don't know quite what to look for.

Biochemical Studies

Some investigators have proposed to identify learning-disabled children by chemical analyses of their hair (177). Those studied clearly differed from normal children with regard to the amounts of lead and cadmium in their hair. This study was conducted using atomic absorption spectroscopy, which is quick, inexpensive, and unobtrusive to the subject.

The behavioral effects of toxic levels of lead have been documented in scientific journals (37). There is increasing evidence that even low levels of lead can have negative effects on children's behavior. Hyperactivity in children has been studied as a possible outcome of exposure to toxic levels of lead although methodological questions have been raised about the control of socioeconomic factors in such studies. This kind of analysis might lead to early intervention and provide insights on etiology.

The results of blood tests for monoamine oxidase in dyslexic children are reported to differ significantly from those of control groups. This enzyme is critical in the metabolism of dopamine, norepinephrine, and other monoamines. These chemical substances perform special roles in the brain. Some hypothesize that hyperactivity is the outcome of disrupting the dopamine economy of the brain (105).

Biochemical Studies of Drug Treatment for Hyperactivity

Although the physiological or structural basis of hyperactivity is not agreed on in medical and scientific circles, several reports in the 1960's converged on the observation that stimulant drugs have the "paradoxical" quality of calming many hyperactive children. In the 1970's, there was much controversy about the abuse of these drugs by physicians and educators.

Opinions about the wisdom or effectiveness of treating hyperactivity by drugs are in conflict. Despite the lack of conclusive data, psychostimulant drugs became popular in the 1960's and 1970's. Krager and Safer (121) conducted a study in Baltimore County, Md., in which they found a 62 percent increase in the use of drugs in public schools between 1971 and 1973. The corresponding increase in the use of drugs in parochial schools was 77 percent.

Stimulant drugs have been among the most frequently used and most extensively studied of pediatric drugs (126). Some research indicates that hyperactive children respond to such drugs as Ritalin[4] and Tofranil[5] with reduced hyperactivity and distractibility (182). Harmful side effects of the drugs include nausea, vomiting, insomnia, bedwetting, abdominal pains, and even psychosis (38).

The Orthomolecular Approach

Also controversial has been the treatment of learning disabilities with large doses of vitamin and mineral supplements along with improving the child's diet. Cott (51) reports that this "orthomolecular" intervention has helped more than 50 percent of hyperactive children in his practice. Cott reports that Vitamin B, has been used effectively to improve sleep patterns of learning-disabled children, while large doses of Vitamin B, have a calming effect. An agent called "cupramine" is prescribed to counteract the effects of toxins like lead in the body.

Despite Linus Pauling's support of orthomolecular therapy in the late 1960's (158), the medical community has far from accepted megavitamin treatment. The American Psychiatric Association in 1973 and the American Academy of Pediatrics in 1976 made formal statements that such treatment was without sound theoretical or empirical basis.

Identification Techniques

Swanson and Kinsborne (198) proposed one of the most controversial means of diagnosing hyperactivity, namely, in light of the child's response to stimulant medications. Most professionals have continued to try to predict which hyperactive children will respond favorably to stimulant medications (17).

Technologies for Instruction

When a teacher is working with a student individually much flexibility is possible. Programs can be tailored and spontaneously modified to suit a child's learning style. If the present estimates of the number of learning-disabled children in this country are even roughly accurate, the cost of providing individual instruction to these students would double or triple the present cost of education (130). Schools are increasingly buying microcomputers. Computer programs could be designed to fit a broad range of learning styles and would thus be appropriate for integrated classrooms.

Despite the growing number of microcomputers in the schools, appropriate curriculum software for special education students is not necessarily available. The software available is frequently unable to make computers cost effective and instructionally sound.

In addition, the design of the available instructional software that is available is often educationally unsound. If the microcomputer is to fulfill its potential in the schools, a considerable amount of time and thought must be devoted to developing educationally valid software (184).

The advantages of microcomputers have been described recently in a leading learning disabilities journal (184):

1. Microcomputers are "user friendly" and can talk with the student—actually calling the student by name. Learning is less threatening to the extent that the computer doesn't chastise the learner for incorrect responses.
2. The learner has the computer's undivided attention: it is not necessary to wait long periods to respond or be responded to.
3. The student with learning differences may work more slowly and the computer can wait indefinitely.
4. Computers can provide immediate feedback and frequent praise, appropriate for the learning-disabled student, who often has an injured sense of self-esteem.
5. Drill and practice—perhaps more necessary for learning-disabled students than others—can become exciting with the use of animation, sound effects, and games.
6. Programs are available that enhance thinking skills. Software like "LOGO" can simulate real-life situations, involving students in the decisions and consequences of problem-solving.

Programs that provide multisensory instruction (requiring the student to see, to listen, and to move) have been judged a particularly effective use of the microcomputer. Video tapes, video disks, and voice synthesizers can further enhance multisensory teaching. Video tape recorders provide the opportunity for frame-by-frame editing of written work. Graphics tablets and equipment like "Versa Writer"[8] make it possible for the student to write as well as type into the computer (184).

Calculator devices that give instant feedback in spelling and mathematics are now available to consumers. Texas Instruments has recently developed Speak and Spell[9], a teaching calculator that boasts some features of larger, computer-based systems. A recorded voice asks for the spelling of a word. The user "keys" in the spelling, which appears on an illuminated display. The recorded voice then says whether the spelling is correct. An incorrect spelling is met with the word correctly spelled out on the display as the voice correctly pronounces it. This device might be particularly valuable for those who have visual-motor difficulties and who find writing words laborious and confusing.

The "Talking Books" program for the blind and physically disabled is part of the Library of Congress and supported with Federal funds. Learning-disabled individuals who want to qualify as program users must furnish evidence of being physically disabled. This requirement is met by providing a letter from a physician affirming neurological impairment. Frank Clyke, Chief of the Division for the Blind and the Physically Handicapped of the Library of Congress, states that learning-disabled individuals are neither aware of this requirement nor able to meet it. Advertising the program to the learning-disabled population, then, according to Clyke, is like "waving a red flag" (130).

Technologies for Evaluation and Research

Data-processing systems are now being developed to support service systems for the learning disabled. In San Diego, an interdisciplinary learning disabilities diagnostic clinic has begun to feed clinical information to computers (2). The system, described as inexpensive, simple, and efficient, would make cross-sectional and longitudinal studies of treatment outcomes possible.

Helmer Myklebust, one of the founders of the learning disabilities field, has suggested a computer-based evaluation system for special education. An evaluation center would conduct experimental studies in learning to determine the effects of various handicaps. Data collected with a battery of educational and psychological tests would be fed into an average-sized computer. The computer would provide researchers with sufficient data to observe significant relationships (111). Computerized technology would allow the evaluation of remedial programs. Weekly and monthly evaluation of children's progress would also be facilitated.

Computer-controlled physiological and psychological measures of brain responses while an individual performs learning tasks make it possible to isolate certain cognitive processes. Such tests of visual-perceptual and symbolic processes have already been used with electroencephalographic measurements (106).

Using Technologies Originally Designed for Other Handicaps

Braille has been suggested as a technology that severe dyslexics can use (135), as have other materials originally designed for the physically handicapped. Sign language has been suggested for those with language disabilities. Other potentially useful technologies from different fields include video, biofeedback, computer simulation studies, and industrial arts curricula.

Periodicals on Educational Computing

Journals on computer use in the schools are few despite the explosion of periodicals on all types of computer expertise and interest. The following periodicals treat educational computing: *Classroom Computer News, Closing the Gap, The Computing Teacher, Electronic Learning, Educational Technology,* and *Turtle News.*

Soft Technologies

The most important recent contribution to soft technology in the learning disabilities field was the passage of Public Law 94-142. The cornerstone of the law is the individualized educational plan (IEP), which requires that the school and parents agree on a program for any children identified as special education students. The IEP procedures also include due process delineations. Placement in the "least restrictive environment," the legal mandate to integrate handicapped with nonhandicapped students, has met with the criticism that is supported neither by theory nor by facts. Others see it as a reasonable alternative to small classes with special education personnel.

The History of Legislation

Pubic Law 94-142, the history-making legislation for handicapped children passed by the 94th Congress, can be seen as part of a social movement to guarantee for handicapped people those opportunities accorded nonhandicapped citizens. The movement began to gather force in the 1950's and 1960's, as the silent sibling of the far more dramatic, widely publicized civil rights movement. Both movements pressured for integration into the mainstream of American life.

In 1950, the National Association for Retarded Children was established. It was the first of a number of parent action groups. In 1958, the idea that mentally retarded children have the right to be placed in the best available educational environment was presented in a debate sponsored by the National Education Association. This view was echoed by the International League of Societies for the Mentally Handicapped. A number of court cases in the 1970's established education for the handicapped as a civil rights issue: children could not be discriminated against on the basis of their handicaps.

The court cases of the 1970's established the following principles:

1. every handicapped child, despite the severity of his or her handicap, had a right to a free appropriate education;
2. equal education opportunities must be provided by the schools to handicapped children, meaning that one of the schools' goals would be for these children to fulfill their potential despite any handicap;
3. to the greatest extent possible, handicapped children must be educated together with the nonhandicapped; and
4. parents, guardians, surrogate caretakers, and the child must be notified of special education placement with the possibility of influencing that placement (130).

Most of these ideas became part of the Elementary and Secondary Education Amendments, Public Law 93-380. Grants to States were increased for the purpose of identifying, locating, and evaluating all handicapped children to establish a policy of providing full educational opportunities.

In response to reports that States and local education agencies were moving slowly and reports from the Bureau of Education for the Handicapped that only 3.9 million out of 8 million handicapped children were receiving appropriate education, the Education for All Handicapped Children Act (Public Law 94-142) was passed in 1975.

Central Features of Public Law 94-142

The purpose of Public Law 94-142 was "to establish a comprehensive mechanism which will insure that those provisions enacted by the 93rd Congress (Public Law 93-380) are expanded and will result in the maximum benefits to handicapped children and their families."

The cornerstone of Public Law 94-142 is the individualized education plan (IEP) (see the earlier section *Intervention*). According to Federal regulations, beginning on October 1, 1977, and at "the beginning of each school year thereafter, each public agency shall have in effect an Individualized Education Plan for each handicapped child who is receiving special education from that agency" (68). The IEP document serves as a written record of the decisions concerning the child's educational program, reached jointly by parents and school personnel at the IEP meeting. If agreement over the IEP is not reached, the parents or the agency may initiate a hearing. The content of an IEP meeting includes statements regarding the following:

1. the child's present educational status;
2. educational goals for the child;
3. special education and related services the child requires (transportation, speech therapy, medical and counseling services, recreation) and the child's extent of involvement in regular education programs;
4. projected dates for initiating services; and
5. evaluation criteria.

In order for the handicapped child to participate in regular education programs, the IEP must specify any modifications the child requires in regular educational settings. If the public agency cannot offer the child appropriate education, it must finance the child's education in a private setting. The program in the private setting shall be developed in accordance with an IEP developed by the public agency.

What may not always be understood by school personnel, particularly teachers, is that the IEP is not a performance contract: the agency neither defaults nor fulfills a contract depending on the failure or success of the child.

If the estimate of the Bureau of Education for the Handicapped that there are 8 million children with handicapping conditions (between birth and age 21) is even roughly accurate, thousands of thousands of IEPs will be written for any given school year and the writing will involve several professionals for each handicapped child.

The mandate for the "least restrictive environment" in Public Law 94-142 is in practice considered "mainstreaming." Handicapped children are placed in regular classrooms along with nonhandicapped children. Some special education students spend part of the day in special classes and part in regular classes, depending on the subjects taught and what the child needs as specified by the IEP. "Resource rooms" are provided with special education personnel and curricula for handicapped children. The severity of the handicap greatly determines what amount of time the child will spend in a special program and what amount in the regular classroom. The wealth of special education classes, services, and regulations developed to implement Public Law 94-142 have closely followed the design of Deno's (58) "cascade." The intent of this model is to provide flexibility in the services for exceptional students.

Some argue that there are neither theoretical nor empirical reasons to believe that mainstreaming helps handicapped children learn more (115). Others see mainstreaming as the alternative to labeling and consequent social isolation and lowered self-esteem. It is also frequently less expensive to teach children in standard classrooms than in special education settings.

Implementing Public Law 94-142

Local school districts are pressed for sufficient funds to meet the requirements of the new law. Paradoxically, school districts feel the financial strain of remaining compliant, which means that the costs of receiving Federal funds are high—perhaps too high.

In October 1980, Federal agencies began to cooperate to avoid duplication of efforts in implementing and enforcing of the law. The Office of Special Education and Rehabilitative Services and the Office of Civil Rights agreed to share data and duties relating to enforcement and investigation. The two agencies also monitor implementing the regulations of Section 504 of the 1973 Rehabilitation Act. A decision was also made to publish notices in the *Federal Register*, notifying the public of policy interpretations and upcoming policy statements. For example, in January 1981, extensive clarification of the IEP was published. This basic explanation of what is considered to be landmark legislation comes many years after its passage (68).

CURRENT ISSUES IN THE FIELD OF LEARNING DISABILITIES

Problems of definition, identification, and treatment are in part rooted in the social movement toward integrating services for handicapped people with the nonhandicapped. This social movement has not awaited on scientific evidence about the cause of learning disabilities, for the development of valid identification instruments, nor for a well-developed set of outcome studies on the effectiveness of the most commonly used treatments. Research in learning disabilities is characterized as lacking agreed-on methods of defining its subject and subject population. It is also described as lacking scientific rigor.

Labeling, apparently required to provide appropriate services for the learning-disabled population, has been criticized for resulting in social isolation and emotional wounds. Alternatives to labeling include noncategorical teacher education and special education programs. These alternatives have been criticized as resulting in programs unable to meet the range of students' needs in special education.

Issues of Definition

The current definition of learning disabilities assumes that learning-disabled individuals are of normal intelligence and have adequate educational and social backgrounds. This definition may reflect social pressure rather than scientific fact. There is still no definitive scientific evidence that learning disabilities are biological disorders. The method identifying them is based on the purported discrepancy between present performance and "potential." IQ tests, the most common method of measuring potential, have been judged as invalid for the learning-disabled population.

The Lack of Agreement About the Nature of Learning Disabilities

As discussed above, a major point of disagreement is the question of whether learning disabilities are physiologically based. Since by definition learning disabilities are problems in learning not attributable to any other well-known impediment to learning (lack of intelligence or proper education, an impoverished environment, physical impairment, or serious emotional disturbance), many reason that such disabilities are likely to have a physiological basis. Many experts in the field see learning disabilities as based in the interaction of several factors, some that have "neurological" implications and others that do not. Such factors include experience with schools and teaching approaches, the expectations of others, and learning style.

Learning-disabled individuals are regarded as normal in many respects although they perform surprisingly poorly on certain learned tasks like reading, writing, math calculations, speaking, or listening. These are frequently taken as indications of some sort of irregularity in brain function, complicated to varying degrees by psychosocial factors. Some literature indicates, however, that learning-disabled people have deficits more pervasive than difficulties in school-related tasks. Kronick (124) has argued that difficulties in social development are not uncommon in such persons.

The Lack of Scientific Evidence for a Physiological Basis of Learning Disabilities

The definition of learning disabilities, then, may be interpreted to imply that they result from some sort of organic brain problem. The lack of scientific evidence for this interpretation is discussed in the literature (174,175). Although there is a growing body of neurophysiological research on brain functioning, it has not yet yielded definitive evidence that learning disabilities represent dysfunctions of the brain.

Debate over the definition of learning disabilities has centered on just this point: What is the cause (or causes) of such disabilities? What sort of handicaps are they? Can individuals with such disabilities be cured or must they simply learn to accommodate? Is "learning disability" merely a label invented by our social system (93)? At one extreme, Mann (132) stated that such characteristics of learning disabilities as "process deficits," "visual-auditory configurations," and "visual-spatial disorders" are not really characteristics of the brain but rather "make-believe fantasy."

Without definitive scientific evidence to support the claim of brain dysfunction, specialists in the field have understandably been criticized for passing off myth as science (124,186). In answer to the criticism of ambiguities and contradictions of the field, there have been rejoinders for greater clarity (152). Methods and philosophies of identification have been marked for criticism: Are identified children actually learning disabled or are they simply casualties of the educational system, or both? Or are there two separate groups of learning-disabled individuals—one neurologically impaired and the other not?

The Legal Definition of Learning Disabilities: Scientific Fact or Social Consensus?

With the passing of Public Law 91-230, title VI, part G, in 1969, Congress legally recognized a handicap whose nature and cause are in contention. The study of learning disabilities has been described as a field having "more momentum than direction" (150). Thus, at that time it fell to the

Bureau of Education for the Handicapped to establish criteria for identifying learning-disabled children. The purpose of constructing a definition was to establish a criterion for State and local education agencies to identify learning-disabled individuals and to develop programs for them.

Frank King, a psychologist in the Office of Special Education and Rehabilitative Services who had a central role in authoring the procedures, has described the process as a frustrating effort to reach consensus: the definition called for providing "information that was beyond science at this stage" (130). The legal definition, then, might be said to be a better reflection of social than of scientific fact. Louise Bates Ames of the Gesell Institute has said that "the term learning disabilities caught on and swept the country before we had really reached a satisfactory definition of what it meant, and certainly before we knew what to do about it!"

Even these who wrote the definition have been described as not expecting that children with learning disabilities could actually be identified or diagnosed on the basis of Public Law 94-142 alone. The definition, after all, was recognized for what it was—a definition of a condition in terms of what the condition is not (130).

The Issue of Assuming Normal Intelligence

Before the the term "learning disabilities" was coined in the 1960's, an inability to learn in school was most often seen as mental retardation, cultural disadvantage, emotional disturbance, physical impairment, blindness, or deafness. The particular contribution of the concept of a learning disability was the recognition that some people were unable to learn although they had normal intelligence, health, adequate education, sufficient motivation, and normal participation in the cultural mainstream.

Intelligence tests were applied to identify this population, with the exception that those with learning disabilities would score within the normal range.

There is evidence, however, that although the IQ scores of children labeled as learning disabled by their school districts are not in the retarded range, a good number are below the mean of the general population (91). A survey of 3,000 children diagnosed as learning disabled corroborates this finding (113). This second study found that the median IQ of the surveyed population was 93 (90 to 110 is average) and 35 percent had IQ scores under 90.

The Issue of the Discrepancy Between Potential and Achievement

Some in the field have proposed a functional definition of learning disability. Bateman (19) has stated that a learning disability is defined by a large discrepancy between what a child has achieved and what the child is capable of achieving. In the early grades, a lag of 6 months in academic performance is considered a notable discrepancy, while in grades three and higher, a notable discrepancy would consist of 1½ years (35).

It is far more problematic to determine what a child is capable of than to measure what the child has already done. Usually, the child's "potential" is measured by intelligence tests. These tests, however, are not without their problems. The very skills required to score well on many subsections of intelligence tests are those often affected by a learning disability. Thus, the individual's score on such tests may be just another indicator of a learning disability rather than a valid measure of "potential."

Questions about the validity of IQ tests are not uncommon in the field. Performance is quite variable for children who might be affected by stress, the nature of the testing setting, or the tester's personality (134). For the most part, intelligence tests correlate very well with school achievement. They have been questioned as predictors of school achievement for those with learning disabilities (35,103).

The Issue of Assuming That Environmental Disadvantage Is Not the Problem

The legal definition of a learning disability is considered to ensure that children provided services for the handicapped have a disorder most likely attributable to a subtle organic dysfunction rather than to an inadequate environment. To make this distinction in practice, however, is problematic. Do children with environmental learning problems actually look different from those with learning disabilities?

There appears to be no definitive research indicating different neurological or behavioral mechanisms in middle and lower class retarded readers. One study has indicated that similar patterns of performance are seen in middle and lower class children with reading problems (27).

Blank (28) points out that excluding "environmental disadvantage" as a possible reason for a learning disorder excludes a large group of retarded readers. Children from poor socioeconomic backgrounds, he states, are the largest single group of retarded readers in this country. Poor children who are poor readers are not necessarily learning disabled. On the other hand, children from low socioeconomic backgrounds might be more "at risk" for neurological damage and, once it occurs, less able to compensate for it.

A not infrequent observation among school practitioners is that most of the children in classes for the "mentally retarded" are from lower socioeconomic groups and most of the children in learning disabilities classes are from middle and upper socioeconomic groups.

Issues of Identification

The standardized testing instruments used to identify learning-disabled individuals have been criticized as invalid by researchers. Some practitioners ignore the results of this research and continue to use these instruments. These tests assume the existence of underlying abilities that are prerequisites for academic success, but the existence of these abilities is questionable. Performance on these tests doesn't consistently correlate with school performance. Public Law 94-142 does not delineate job roles relating to identification procedures in educational agencies.

Issues About the Instruments That Identify Learning Disabilities

Some of the most commonly used tests for learning disabilities have been criticized for lacking validity (47). The Illinois Test of Psycholinguistic Abilities (115), once widely respected and used, has been criticized for poor technical inadequacy as well as for its poor validity (94). Another commonly used instrument is the Bender Visual-Motor Gestalt Test (20), designed to measure the ability to integrate visual information relating to the proper hand movement ("motor") for copying designs. Performance on this test is regarded as an indication of neurological development (20

A study by Ackerman, Peters, and Dykman (1 indicates that there is little correlation between scores on the Bender test and the results of neurological examinations. Some studies report that the Bender test is a good instrument to identify reading problems (98,119) while other studies have found it to be a poor diagnostic instrument for academic performance (96,171).

The Variation in Operational Definitions of Learning Disabilities

Most States have adopted the Federal definition of a learning disability in Public Law 94-142. Even so, apparently unimportant variations of the Federal definition have led to a range of interpretations. Some States, facing financial limitations, have made an attempt to identify a minimum number of learning-disabled students by using a psychometric measurement of the difference between IQ and present school performance. This approach is similar to that proposed by the Federal Government (66). Another State has attempted to accomplish the same end by requiring evidence of neurological impairment. Given decreased Federal and State support for services for the learning disabled, the vagueness of the Federal definition has led States to adopt procedures that limit the number of children served (188).

Assumptions Underlying Assessment Procedures

"Differential diagnosis" and "prescriptive teaching" are the predominant models for assessment and instruction in special education (11). "Differential" refers to discriminating among the possible causes of the learning disorder and to identifying the different learning strengths and weaknesses of the individual. What is purported to be "diagnosed" are the abilities presumably required for academic achievement. According to this model, learning problems are the expressions of inapairments in abilities that lie below the surface. These abilities often are referred to as "psycholinguistic abilities" and "perceptual-motor abilities." The existence and measurability of these unseen abilities has been criticized as nothing more than a presumption (132). The model, however, is still used despite this criticism (11).

Some Organizational Issues in Assessment

Federal regulations specify that the handicapped child's assessment should be carried out by an "interdisciplinary team." However, the regulations do not spell out the role that each profession should take in assessment and treatment. A recent survey of 114 educators indicates that there may be some correlation between this lack of job specificity and job stress (71). The study suggested that two significant predictors of job stress were lack of role clarity and a discrepancy between the professionals' own views of their roles and the views of others about those roles. Diagnostic tasks requiring the cooperation of professionals from different disciplines were cited as particularly stressful.

The responsibility for evaluating children with learning problems often falls to specialists rather than to classroom teachers. It has been suggested that those who are assessing and planning for the handicapped child are not necessarily those who know the child best (202).

The procedure delineated by the law presupposes that the specialists administering the tests are familiar with the remedial options available to the child. The law seems to assume open communication among departments and disciplines.

The lack of communication between specialists is often cited as a problem in the literature. This point is particularly important given the mandate for interdisciplinary evaluations. It has been noted that school psychologists tend to see their jobs as finished when the testing results are written up. It is not always possible for the outside specialists to see that testing results are consistently applied if at all (114).

It is not surprising that decisionmaking in identification procedures has been characterized as inconsistent (199). With regard to administrative questions as well there appears to be a lack of agreement about the procedures of assessment as well as the uses of testing results (154).

Issues of Treatment

With the increased accountability of schools as delineated by Public Law 94-142, educators feel pressured to develop new programs. Commercial companies have flooded the market with educational materials advertised as appropriate for meeting the law's requirements. Results of research on the effectiveness of educational, pharmacological, or dietary treatments are far from definitive. School personnel and parents frequently feel at a loss for any reliable basis on which to decide treatment plans.

The Pressure for New Programs

School districts are described as investing heavily in new programs without having evidence of their effectiveness. New assessment and treatment materials appear on the market daily—publishers of educational materials have discovered special education is a lucrative market. Feeling the pressure of increased accountability, schools may well be vulnerable to commercial advertising (47).

There is pressure within the field of education to deal with the staggering financial, psychological, and social costs of school failures. The cost of retaining children because of school failure is nearly $2 billion per year. The cost increases when one considers the well-established relationship between illiteracy and delinquency, imprisonment, and unemployment. In this country, half the unemployed between ages 16 and 21 are illiterate (109).

Large heterogeneous groups of children working at different instructional levels within the same room, taught by one teacher, are often thought to require "individualized" programed materials. The demand for programs designed to instruct highly heterogeneous classrooms has understandably increased in recent years.

The Lack of Satisfactory Studies of Treatments for Learning Disabilities

Treatment strategies are frequently based on theories of what might cause learning disabilities. Because neither the theories nor the treatments have been sufficiently substantiated, efforts continue in the field to conduct methodologically rigorous outcome studies of a range of interventions.

Hallahan and Cruikshank (92) reviewed several dozen studies of perceptual-motor training and found that nearly all were methodologically unsound. Two methodological problems common to all outcome studies in this field are their lack of control for the so-called "Hawthorne effect" and their inconsistent and incomplete definitions of their experimental subjects. The Hawthorne effect refers to a phenomenon commonly observed in research: any new treatment can lead to improved performance independent of the treatment itself because of the special attention provided the subjects. With regard to defining the learning-disabled population, some studies consider those students 2 years behind their classmates as learning disabled, while others use students who happen to be assigned to learning-disabled classes by their school districts. Thus, what might be shown in one study may not apply to another group of so-called learning-disabled students, and the usefulness of the research is compromised.

Outcome Studies of Dietary Treatments for Learning Disabilities

Benjamin Feingold, a California physician, states that 50 percent of the hyperactive children he treated responded positively to a diet devoid of artificial flavorings and colorings (69). Naturally occurring salicylates were also excluded from the diet. Decrease in both hyperactivity and impulsivity were the reported outcomes of the diet. In the same year that Feingold's results were reported, the Nutrition Foundation, supported by commercial food companies in the United States, established a National Advisory Committee on Hyperkinesis and Food Additives. The Committee found that Feingold's work was not sufficiently supported by empirical evidence (147).

A recent study of the Feingold diet (49), however, was judged methodologically sound. This study found that between 5 and 10 percent of the subjects became more hyperactive after the addition of food colorings to their food.

Some Issues Concerning Drug Treatments

Reported problems of treating learning and school-related difficulties with drugs are the following:

1. these difficulties do not justify the drugs' use;
2. the drugs have short-term side effects, such as nausea, vomiting, insomnia, bed wetting, abdominal pains, and psychosis; and
3. the drugs may have long-term effects, such as changes in growth rate and heart functioning (38).

Evidence for the effectiveness of Ritalin® and similar drugs is far from definitive, yet some estimate that up to 600 000 children (mostly boys from kindergarten through eighth grade) are now receiving medication for "hyperactivity." Such estimates go as high as 20 percent of the school age population (39).

Teachers are often expected to monitor medications, but are not given sufficient information about drugs' effects (102). A recent survey of 62 teachers indicates that, although on the average at least one student in every class takes medications, only 36 percent of classroom teachers know of any school policy either condoning or prohibiting the administration or taking of drugs (143). This study also reported that the system for monitoring medications was too loose and that there was not enough communication between teachers and physicians.

Issues Concerning Sensory Integrative Therapy

Sensory integrative therapy is a system of assessment and treatment used by occupational therapists for learning-handicapped children. The theory, based on neuroanatomical and neurophysiological concepts, holds that learning disabilities are caused by disorders of the vestibular system, which is the part of the brain controlling balance, posture, and consciously controlled movements.

A physician recently wrote to the *Journal of Learning Disabilities* protesting the prescription of sensory integrative therapy by occupational therapists (124). The treatment, described as expensive and time-consuming, is based on a theory for which there is no "valid, convincing proof." After running an extensive literature search, the physician reported that there is little evidence to show that this type of treatment has directly helped learning disabled-individuals. He found existing research methodologically unsound, supported only anecdotally.

Issues Concerning Remedial Education Therapies

Remedial education therapies treat learning disabilities more straightforwardly than do therapies that attempt to address presumed underlying causes. Remediation attempts to modify the learning behavior itself. Children are taught basic academic skills, often with attention to their individual learning styles. Like other treatment methods, remedial ones seem to be evaluated little by sound outcome studies.

Pihl (163) reports that evaluation of remedial strategies has been "pessimistic." In the long run, retarded readers tend to remain retarded readers. John Richards, director of the Kaiser-Permanente Learning Disability Clinic in San Diego states that it is not uncommon to find children of 11 or 12 who have received high-quality educational intervention and remediation and who have not made significant improvement (170). These children, Richards states, tend to come from families who have histories of learning problems. After a period of remediation, many children tend to reach a point beyond which they don't progress; in junior high school, they are still reading at the level of third or fourth grade. Richards describes reading as "not an efficient and effective way for them to get information." Both Pihl (163) and Richards (170) criticize the schools for organizing all learning around reading. Children who are unable to read are often intelligent, capable people who learn at an average or higher rate in other areas of their lives.

Issues of Research

Common criticisms of research in the field are that learning disabilities are inconsistently defined and that different measures are used in studies. This strongly suggests that the central purpose of the research—to generalize the findings to larger numbers of people—is seriously compromised.

One of the most commonly cited problems of research in the field is the lack of a satisfactory definition, and more specifically, the lack of agreement about the characteristics of individuals with learning disabilities. How is the population to be defined? If researchers identify learning-disabled subjects in an arbitrary manner, how can the results be generalized?

Criteria for selecting subjects differ widely. A review of research in the field over the last 3 years indicates that 50 percent of the studies used the criterion of discrepancy between "expected grade level" achievement and actual achievement (200). Actual achievement was defined narrowly as reading level. In 9 percent of the studies, psychological rather than academic tests were used to identify the learning disabled. A good percentage of the studies used samples of "learning-disabled" children who were not identified as learning disabled by their school systems.

The same review of the research found that over 50 percent of the research surveyed had used experimental measures or tests that had not been employed in previous research. This finding strongly suggests that a central problem of the studies would be to establish the validity of their measuring instruments. Only 2 studies in 10, however, addressed the question of the validity of the measures they used.

Labeling

Arguments in favor of labeling point out its necessity for the delivery of appropriate services and its function of educating the public about policies for an underserved population. Attempts to address the well-documented social and emotional costs of labeling include noncategorical special education programs in educational agencies and noncategorical special education training for teachers.

Social and Emotional Responses to Labeling

There is, of course, a good reason for labeling: to ensure that educational organizations provide children with appropriate services. Public organizations are often compensated on the basis of how many handicapped individuals have been identified or labeled. Labeling and providing services, at least in public agencies, go hand in hand (174). Some have commented that labeling has the positive effect of bringing to the public's attention a problem that should be addressed by public policies (78,117).

Labeling has been extensively criticized. One two-volume classic delineates the dangers inherent in any classification or labeling system (101). Others claim that labeling offers no solutions and obscures important distinctions (180). The person labeled "learning disabled" tends to be perceived by others as more like the retarded person than "normal" people. In addition, the person tends to be seen as having weaknesses in moral standards and personality (192).

Some studies have found that the label is sufficient to produce negative evaluations from teachers (73). Other studies contradict this claim, finding that labels are little used by teachers, who actually rely instead on their cumulative evaluations of children over long periods of time (46,169).

The social use of labeling and the social response to it are unresolved issues. Those educational systems trying to operate without labeling find themselves facing the risks of inappropriate placements and teaching strategies.

Attempted Alternatives to Labeling

In response to the social outcry against labeling, many State and local educational agencies have established guidelines to provide noncategorical services, that is, to describe the manner in which the child learns rather than to stigmatize the child with the name of the presumed cause of the learning problem.

In 1972, the Bureau of Education of the Handicapped changed the categories used in funding university teacher training from those of training in "mental retardation," "emotional disturbance," etc., to "noncategorical" grants. In response, universities were pressured to make the shift from that instruction focused on specific handicapping conditions to general educational strategies for all problems in learning, whatever their nature or cause may be. Recent legislation, such as California's Master Plan, has moved toward replacing specialists in particular handicaps with special education generalists called "resource specialists." Distinguishing students according to deficit areas has been described as encouraging a sterile, fragmented view (180). The social reaction against the isolation and stigma associated with labeling can be seen as an argument both for more heterogeneous special education classrooms and more heterogeneous regular classrooms.

Some say that noncategorical special education is doomed to fail. Special education teachers find themselves with only cursory knowledge when confronted with the medical, social, and psychological complexities of many different handicapping conditions. Furthermore, "while lip service is being given to individualized programing and evaluating the strengths and weaknesses of each child, that child may in fact be grouped in such a way as to negate teaching to his known attributes" (127).

Retrospective life histories of adults who have experienced learning problems in school suggest that children feel the stigma of being different even without a label (190,194). The experience of failure, the belief in other students' disdain, or the realization that parents and teachers are disappointed seem to have far more debilitating effects than the label itself.

Some Issues in Implementing Public Law 94-142

State noncompliance with Public Law 94-142 has included using inadequate methods to monitor programs in private and public educational agencies. Interest groups for learning-disabled people have pressured for additional legislative insurance for proper compliance. Mainstreaming has been challenged by learning disabilities researchers as social and political invention rather than well-founded educational intervention.

The passage of Public Law 94-142 was an important event in a period when increasing funds were devoted to compensatory education. Implementing the law however, has been problematic. The Federal Office of Special Education informed the California Department of Education in late 1980 that California had failed to comply with the law by failing to adopt and use a proper method of monitoring agencies, including private schools. California's monitoring of supplementary services like counseling, physical therapy, and occupational therapy was also judged deficient. The problem of implementation has been addressed by additional legislation. In California, regulations for implementing Public Law 94-142 (Senate bill 1870 and Assembly bill 3075) are now in the process of draft legislation and public input.

The duplication of effort by agencies and the lack of communication between agencies and departments have been documented on both the Federal and State levels. Those personnel in the schools who deliver services to learning-disabled children and their parents have been described as under particular stress. Professional literature advises administrators to attend to the psychological well-being of their personnel who must implement the new law (59). Special education personnel in "resource" rooms and in self-contained classrooms have been described as experiencing stress directly related to complying with Public Law 94-142 (21).

Meanwhile, to ensure compliance, legislation has increased the accountability of school districts. For example, Senate bill 1870 of California says that all State provisions to comply with Public Law 94-142 must be implemented by June 30, 1982. Assembly bill 2286 in California modifies the use of attorneys by school districts in hearings on issues contested between parents and local education agencies. An agency is not permitted to use an attorney to present its case at the hearing unless the parents of the handicapped child are given written notice. In addition, the parents are given the option of having an attorney paid for by the school district.

Learning disabilities interest groups are beginning to organize in opposition to recently proposed "block grant" funding. President Reagan has also recommended that Public Law 94-142 be repealed. Another issue of great concern to these interest groups is the possible reduction of mandated services to those only for the severely handicapped. Such a reduction could eliminate special services now available to many of the learning disabled (39).

Mainstreaming

The Education for All Handicapped Children Act states that each handicapped child should be educated in the "least restrictive setting." States must ensure that, "to the maximum extent appropriate, handicapped children, including children in private or public institutions . . . are educated with children who are not handicapped, and that special classes, separate schooling, or other removal of handicapped children from the regular educational environment occurs only when the nature of severity of the handicap is such that education in regular classes and with the use of supplementary aid and services cannot be achieved satisfactorily."

Mainstreaming is no small challenge. Ideally, it means nothing less than attempting to set up an environment for learning that is stimulating, but not overly so, to provide individual instruction while inspiring cooperation, and to challenge advanced students while fulfilling the potential of the average and the handicapped as well. This seemingly impossible situation is seen as "least restrictive" simply in the sense that the handicapped child would not be restricted to full-day special education placement.

The rationale of mainstreaming is that the social and emotional growth and thus the learning potential of handicapped youngsters will be enhanced when they are educated together with "normal" children. Often, however, this is not the outcome. The effectiveness of mainstreaming is unclear (36). Ronnie Gordon, professor of rehabilitative medicine at New York University, in a recent study of mainstreaming, concluded that handicapped children are often placed in situations that are more than they can handle. Gordon says that, at best, mainstreaming has increased social contact between handicapped and normal children and that, at worst, it has deprived handicapped youngsters the individual attention they need for intellectual growth (108). A frequently overlooked component of mainstreamed programs is the evaluation and support of the handicapped learner's transfer of skills learned in the special classroom to use in the "least restrictive setting" (172).

The policy of mainstreaming has been criticized severely as a "policy mandated for political and social reasons, without any basis in a scientific frame of reference or in scientific evidence. Its primary rationale was expediency, and then later it became a fad" (145). Cruikshank, one of the founders of the learning disabilities field and one of the first to design educational interventions for learning-disabled people, has said that the least restrictive placement "will not, in and of itself, solve a single problem for a single child" (216).

Some Issues Concerning Learning-Disabled Adults

There are fewer identification and treatment programs for learning-disabled adults than for children. Public Law 94-142 only mandates services for individuals up to age 21. Recognizing learning disabilities in adults is one of the more recent developments of the field. An extremely high percentage of adults in prison are said to be learning disabled. Unemployment in the learning-disabled adult population is very high. Prejudices interfere with learning-disabled adults getting hired; their handicaps may make many aspects of their jobs difficult.

The Identification of Learning Disabilities in Adults

Because the field of learning disabilities is new and because less than a decade has passed since schools were mandated to identify learning-disabled children, it is not surprising that the great majority of learning-disabled adults have not been helped. Problems in identifying learning-disabled adults include the fact that many tests commonly used for children are not designed for use with adults, and that by adulthood, many aspects of a handicap may have been obscured by both creativity and intelligence and by problems in social and emotional development.

Although "symptoms" of learning disabilities in adulthood are not as clearly identifiable as they are in childhood, there is general recognition in the field that learning disabilities are not necessarily a transient problem of development. Acknowledging this point, the President's Committee on Employment of the Handicapped entitled its pamphlet on learning-disabled adults "Learning Disability: Not Just a Problem Children Outgrow" (31).

Learning Disabilities, Unemployment, and Imprisonment

Unemployment among the learning-disabled adult population is very high (9). Potential employers, not understanding the nature of the handicap, often turn down learning-disabled adults. Certain learning disabilities can affect the speed and quality of performance on certain tasks. Learning-disabled adults have been known to work on their own time in order to complete their jobs (157).

Difficulties in areas other than reading or writing can interfere with job success. Those tasks associated with leaving home and entering into the mainstream of life—finding an apartment, reading maps, dialing a telephone, correctly processing information heard over the phone or seen on television—are experienced by some as insurmountable hurdles (130).

Some estimate that 80 to 90 percent of the current prison population is learning disabled. Recent studies by the General Accounting Office and the Law Enforcement Assistance Administration indicate that as many as 32 percent of incarcerated juvenile delinquents may have learning disabilities (130).

Treatment for Learning-Disabled Adults

The Education for All Handicapped Children Act is, exactly as named, one for children. The law covers learning-disabled individuals only up to age 21. The Office of Special Education and Rehabilitative Services recently formed a task force on learning disabilities and concluded that learning-disabled adults were eligible for government-supported services. This suggests that the landmark legislation, the Rehabilitation Act of 1973, would apply to the learning-disabled adult. Programs for the learning-disabled adult, however, are still rare.

DIRECTIONS

The issues discussed above suggest various possibilities regarding the use of hard and soft technologies to serve the learning-disabled population.

The possibilities discussed below are based on the current literature in the field of learning disabilities. Some are taken directly from this literature, others are deduced from the current work of theorists and researchers. None are recommendations. Instead, they are designed to illustrate the range of possible directions in regard to the use of technologies. All these possibilities, grouped as those treating either hard or soft technologies, are, of course, informed by the particular nature of learning disabilities.

Most individuals with learning disabilities take part in the mainstream of public and private life, looking and acting like others. Many learning-disabled individuals are distinguished only by their performance on certain tasks. Often they hide their inabilities for and failures on these tasks. Their failures also may be misinterpreted as a lack of motivation. The untutored eye may either see these individuals as "normal" or not recognize them as individuals with learning strengths as well as learning weaknesses.

Paradoxically, only in societies as technologically advanced as that of the United States are those with learning disabilities identified as handicapped, that is, by development of technologies like those developed for brain research and psychoeducational assessment.

Hard Technology

Public Law 94-142 specifically mentions the use of "telecommunications, sensory and other technological aids and devices" as relevant to "instructional materials" for the handicapped. Tape recorders, video tapes, and typewriters are not uncommonly used to compensate for a range of learning disabilities. Possibilities for research and development in hard technology include the following: conducting research in brain functioning and the biochemical bases of learning disabilities, establishing a national consultancy for research on brain functioning and the biochemistry of learning disorders, developing computers and other systems for legislation and implementation, and encouraging groups to share technology for the handicapped.

Support Brain Research

Further brain research could be supported for its potential contribution to uncovering the physiological, biochemical, and possibly environmental etiologies of learning disabilities. The refinement of brain research techniques could lead to efficient, valid, and nonintrusive means of prevention and early identification. Brain researchers might find that learning disabilities are not one kind of learning disorder but rather a set of them. The classifying of learning disabilities into more precise types would in turn clarify definitions for studies of epidemiology and treatment. Finally, by specifying the physiological and biochemical bases of learning disabilities, the way environmental, social, or psychological factors contribute to learning disabilities might be clarified.

A promising and active area of brain research in the field is "neurometrics." As was discussed earlier, neurometrics is a new method of gathering and analyzing data on the activity of various regions of the brain. Connors (49) suggests that more promising and accurate results might be found with "evoked potential used to measure differential processing of verbal and non-verbal information." Rather than simply comparing the recorded brainwaves of learning-disabled subjects with the records of control subjects—which has shown no significant difference between the two groups—all subjects are given verbal or nonverbal tasks while the recording takes place.

Other promising brain research is that attempting to specify the functions and integrative processes of the right and left hemispheres. Investigation of gender differences in brain development is also important given the estimates that the learning-disabled population contains anywhere between 3 to 10 times as many males as females. Other promising research is that carried out through autopsies of the brains of those diagnosed as learning disabled before death. All these research areas are active and worthy of support.

Support Biochemical Research

The possible effects of environmental toxins like lead and of certain drugs could be the subject of continued research (see the discussion of biochemical research in *Issues of Research* above). Hyperactivity could be further investigated to determine whether it can be decreased in some by eliminating from their diets food additives and salicylates. Such investigations could lead to in expensive, less dangerous treatments.

Pharmacological research might continue despite public objections about drug misuse. Pihl (163) writes that "one can readily envision daily use of drugs that affect the transmission of specific kinds of nerve impulses in localized regions of the cerebral cortex, counteract junk-food diets and contaminant laden environments."

Develop Computer-Based Teaching Systems

Development of computers for use by schools and individuals might lead to reduced treatment costs. Individualized computer programs can be designed for a range of learning styles and academic levels. Classroom microcomputers could support the heterogeneous student populations of mainstreamed educational settings.

Develop Computer-Based Information Retrieval Systems

Data collected on learning-disabled individuals could include those on developmental histories, school histories, histories of intervention, academic progress, learning styles, test results, and teacher observations. Through the use of computers, learning-disabled students would be able to change schools, including from public to private ones, and yet enjoy program continuity.

Develop Technology To Serve a Range of Learning Styles

Practical wisdom as well as research indicates that those who have learning disabilities have particular cognitive or perceptual styles. These individuals are frequently intelligent and capable, but have less flexible ways of learning. Most "normal" children are able to receive information in classrooms in any manner the teacher happens to communicate it. Many learning-disabled children need information presented in a particular way. For example, a learning-disabled person with weak visual skills may need information that is spoken.

Electronics and computer developments in education promise to provide a range of ways to get information across. Development in these areas might shortly bring a time when the written symbol is not the sole conveyance of information and visual learning disorders might then functionally disappear.

Word processors, electronic typewriters, and hand-held calculators and computers all have the potential to provide learning-disabled individuals with ways of circumventing problems in perception, language, memory, and skills required for written productions. Development of these technologically advanced methods could be supported.

Establish a National Brain and Biochemical Research Consultancy

Despite the fact that brain and biochemical research are in their infancies, a number of experienced researchers have made important contributions to these fields. A national consultancy for all those receiving grants for research from the government or major foundations in these fields could lead to standardizing methods of identifying learning-disabled people for research, delineate areas in need of investigation, and support methodological rigor.

Establish a Data Access System on Legislation for Handicapped People

A national system of computer-based information on the implementation of legislation for handicapped people could help remedy widespread confusion and ignorance. A national call-in number could provide access to data.

Establish a Clearinghouse and Data Access System on Mainstreaming and Individualized Education Plans (IEPs)

A national system of computer-based information serving school personnel could aid in mainstreaming and in developing IEPs.

Pool Technology for Handicapped People

School districts and agencies could receive grants from the State or Federal Government to support the sharing of technology for handicapped people.

Soft Technology

Possibilities for soft technology include the following: developing various support and training systems for the learning disabled, parents, teachers, and administrators to implement legislation: supporting pilot and outcome studies to support legislative action, supporting the five learning disabilities research institutes: providing incentives for industry to implement affirmative action programs for learning-disabled adults: and services for the learning-disabled population.

Develop Support Systems for Implementing Public Law 94-142

Those administering and managing school systems and individual schools could be involved in continuing programs of information and support to implement Public Law 94-142, for example, elementary school principals in a given school district could meet monthly to exchange ideas about implementation as it relates to staff management and community relations. There is a wealth of information available from community advocacy groups for the handicapped. Individuals in these groups have become reliable experts on the law. (One such group is California's Bay Area Coalition for the Handicapped [BACH], which conducts workshops on legislation.)

Establish Training Internships

Training internships for students of law, public policy, public health, and organizational psychology could be offered through the coordination of local and State educational agencies. Students could provide information on the law while gaining experience in the area of implementing legislation and related organizational functioning.

Support Pilot Studies on Legislative Action for Handicapped People

New legislation might be informed better by pilot studies. For example, small rural school districts could be compared with large ones, perhaps two of each type, in pilot studies for proposed legislative programs

Support Outcome Studies of Legislative Action for Handicapped People

Outcome studies of how legislation for the handicapped has been implemented statewide, in counties, and locally are all essential. The topics of such studies might include the validity of the notion of mainstreaming as well as the success in implementing it. Some preliminary studies have been done of nine local education agencies in suburban, rural, and urban settings. The activities and consequences of implementation were analyzed for themes both common and unique to the range of settings (63).

Continue Federal Support for the Five Research Institutes for Learning Disabilities

These institutes, in their sixth year of work, have been highly productive. Their research has an educational focus, striving to develop more effective methods for administrators and teachers to work with learning-disabled children. These five institutes are located at the following universities: Teachers College, Columbia University; University of Illinois at Chicago Circle; University of Kansas; University of Minnesota; and University of Virginia.

Survey the Knowledge of Public Law 94-142 Regulations Among School Administrators and Personnel, Parents, and Learning-Handicapped Adults

Compliance regulations for local education agencies could include a program of assessment of legislative knowledge among school personnel, parents, and learning-disabled adults. Determining how well the law is known is essential for implementing and using it. Such an assessment could serve as the basis for inservice programs and community education. Commercial organizations could be given tax incentives for supporting such survey research in their communities. Those conducting the research could provide training opportunities for students of social science research in local colleges and universities, including for learning-disabled college students and other learning-disabled adults.

Develop Incentives for Industry To Implement Affirmative Action Programs Required by the Rehabilitation Act of 1973 Along With the 1976 Regulations

Private industry could be encouraged to employ learning-disabled adults. National organizations with local affiliates such as the Association for Children with Learning Disabilities (ACLD) could be made eligible for grants to educate departments in industrial training and personnel in employing the learning-disabled adult. In the great majority of these cases, employing the learning handicapped does not require any additional hard technology, but only matching the requirements of a given job to the particular talents of a learning-disabled worker. A "Vocational Kit" on employment information has been made available by the California Association for Neurologically Handicapped Children, a local affiliate of ACLD. ACLD could be awarded grants to train counselors in vocational rehabilitation to work with learning-disabled adults.

Develop Support Systems for Special Education Personnel in the Public Sector

Because special education personnel have been reported to be under stress specially related to compliance with Public Law 94-142, support systems could be set up to enhance their work satisfaction and working effectiveness. School administrators, essential in such support systems, could work with organizational consultants on areas like the following:

1. ensuring communication at school, city, and county levels;
2. creating adequate planning time for special education staff;
3. providing recognition for good teaching and for extra time and work;
4. providing support for career advancement; and
5. using school-based computers to relieve special education personnel of some paperwork related to IEPs as well as some daily programing.

Encourage Parent Involvement in Planning and Evaluating Programs

Despite the legal mandate for increased cooperation between parents and school personnel in planning and evaluating special education programs for children, there is increasing evidence that parents are not deeply involved. In California, Project TECH (Training in Education Cooperation for the Handicapped) has been set up by the Special Education Resource Network, California Office of Special Education (39). Project TECH is a training program for parents and school personnel to encourage cooperation in writing IEPs. Teams of parents and school personnel are trained to return to their communities to train others. Programs like these could be encouraged and supported.

Support Self-Help Groups

Dale Brown, an adult with multiple learning disabilities, founded the Association of Learning Disabled Adults (ALDA). The purpose of the organization is to provide support groups for learning-disabled adults and to educate the public. A similar group is the Chicago-based Time Out To Enjoy (TOTE). Within the well-established ACLD is the Adult Committee made up of learning-disabled adults. A learning-disabled adult group called the Puzzle People in Marin County, Calif., provides courses on social skills, financial management, sex education, and vocational skills. Such groups could be encouraged and supported.

Provide State and Federal Support for Programs for Learning-Disabled Adults

Vocational rehabilitation agencies and community colleges are already serving learning-disabled adults and deserve additional support, particularly to train these adults in computer programing and word processing. The "Talking Books" program of the U.S. Library of Congress could be made readily available to learning-disabled individuals and the organizations who provide them services. Use of the program now requires evidence of neurological impairment. Instead, this program could be available to anyone with a visually based reading difficulty. The evidence for this difficulty could take the form of a letter from a physician, teacher, vocational rehabilitation counselor, or health professional.

Provide Federal and State Grants for Consultants To Serve Schools by Providing Computer Hardware and Software

Although school districts are buying microcomputers by the thousands, consultants are needed to perform several tasks: 1) to buy or develop software for special education curricula that are challenging and appropriate, and 2) to buy or develop programs for computer-based curriculum planning and the development of IEPs (see "Develop Support Systems for Special Education Personnel in the Public Sector" above).

Part Two

A Broader Perspective on Learning Disabilities

> Here are the very people of the streets whom he passes every day, here they are coming to him . . . telling him all about it, how it happened, what it feels like, why they did it: Looking to him, right away, for advice and psychic. They are no two of them alike: And their records laid before him range through every intermediate shade . . . . He begins to see that he has more to learn than the use of the stethoscope: He must learn lives.
>
> —Confessio Medici

Part Two
A Broader Perspective on Learning Disabilities

OVERVIEW

An alternative view of learning disabilities is provided by the systems approach. This approach negates none of the findings and theories described in Part One of this case study. Rather, the systems approach presents a comprehensive framework for analyzing the dynamic interaction of biological, psychological, social, environmental, and technological factors.

The systems approach is appropriate for describing the complex system that constitutes the field of learning disabilities research, training, and services, and the larger system of which the field is a part.

Integrating the Approaches to Learning Disabilities

The systems approach presents an integrated view of the context in which learning disabilities exist. Rather than any single factor, the relationship of factors is the unit of observation. The systems view is used as a technology for understanding the existence, prevalence, and nature of learning disabilities.

The Integrative Approach as an Alternative to the Traditional View of Learning Disabilities

The traditional view of learning disabilities is that some unfortunate individuals have them as they might have a cold or a headache (52). The assumption of this approach to handicaps, and to a host of other human problems, is that the disorder resides in the individual, who will carry it until cured (31). Identification, diagnosis, and treatment reflect this assumption. We identify learning disabilities by administering a battery of tests, by taking school and developmental histories, and by observing the child's behavior in the school setting.

In addition, the increasingly sophisticated hard technologies of brain and biochemical research are investigating the physiological nature of learning disabilities. The physiological disorders thought to underlie learning disabilities appear far more subtle than nerve damage, tissue pathology, or abnormal blood measures; they are invisible except possibly to yet more sophisticated research.

The assumption of and search for underlying physiological dysfunctions owes much to the medical model of treatment. Even in school settings, practitioners in the field speak of "diagnosis" rather than "identification" and of "symptom" rather than "difficulty." One of the problems with using the disease model is that students are often referred to psychologists for possible learning disorders when: "The origins of the problem were in the interaction of the school system with the particular needs of the child" (52).

Viewing learning disabilities as medical problems has also been criticized as an attempt to "biologize" what might well be social problems. Theorists have "posited organic casualties for poverty, aggression, and violence as well as for educational underachievement' (47).

The systems or integrative approach does not deny that learning disabilities have a physiological basis. Nor does this approach challenge the possible efficacy of a range of treatments corresponding to the variety of learning deficits. The approach negates none of the specific studies in the current field but rather sets these findings in context. Such an integrative approach considers the relationships of all the component parts—biological, social, environmental, and technological. These relationships are considered to determine the effects of learning disabilities on the lives of individuals, their families, their schools, and their nations.

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The concept of the dynamic relation of many factors is central to the systems approach. Rather than any single factor, it is the relations among factors that are observed.

The systems approach, long ago introduced into biology and physics, made its way into the social sciences. The social sciences attempt to use the approach to understand the existence, prevalence, and nature of learning disabilities.

The Systems Approach to Data: Looking at Relationships Rather Than at Single Factors

Scientific method dictates that researchers attempt to "control" as many confounding factors as possible to observe the relationship between two chosen variables. The systems approach, rather than trying to control or isolate factors, attempts to see how factors fit together. Not surprisingly, the systems researcher is more likely to analyze certain kinds of data along with other kinds.

The causes of learning disabilities are presumed to be not exclusively biological, emotional, or social. The approach helps to explain how so subtle a disorder—so subtle that it was long unrecognized in millions of people now identified—is one that can shape entire lives. It also helps explain why learning disabilities are common in educational settings in this country.

The following relations ought to be considered when using a systems approach to learning disabilities:

- the relation of the left hemisphere of the brain to the right hemisphere,
- the relation between an individual's learning strengths and learning weaknesses,
- the relation between an individual's dysfunction and the gifts the individual has to compensate,
- the relation between the individual and the family,
- the relation between the individual and school personnel,
- the relation of the family to the school,
- the relation of the school to the immediate community,
- the relation of the school district to the State department of education,
- the relation of Federal legislation and Federal agencies to the State department of education, and
- the relation of mandates, such as Proposition 13 in California and Proposition 2½ in Massachusetts, to school function and school personnel.

Even this list is far from complete, since other relations are also potentially significant.

Using the Systems Map: Getting Around Without All the Data

There are many important questions left unanswered. Is there a physiological basis of learning disabilities? Do food additives contribute to hyperactivity? Is mainstreaming helping or hurting those who are learning disabled?

It is not possible to answer these questions before making decisions about identifying and treating learning disabilities. The booming field of study has provided a great number of kinds of quantitative data, many of them contradictory or incomplete.

Quantitative data are important but not sufficient. Important nonquantitative factors to consider are some features of the environment where the handicap occurs. These features provide the map to locate facts and to get a sense of their meaning.

Looking at Lives Rather Than at Single Factors: A Case Study

Describing the life of one with a learning disability is an example of a systems approach to gathering data and interpreting them.

> "John" is an intelligent 12-year-old who lives in a medium-sized American city. He is the oldest of two children. His parents are divorced. His mother has remarried and is living in a small town, hours from the urban area where John lives with his father and younger sister. A custody fight between the parents has temporarily been quieted by a court decision that John should spend 1 year with his mother in the rural school district and the following year with his father in an urban school district. The rural school district employs many teachers who grew up in the area and who attended the very schools where they now work.

> The principal of the school was a classmate of many of John's teachers. The school district is attempting to comply with the new Federal regulations of Public Law 94-142. Specialists are not attracted to the rural school district, but, despite the small number of specialists, the small setting makes it possible to serve the needs of special education students comfortably. Communication among the employees of the school is relaxed, taking place in and beyond the school setting. The school population is relatively homogeneous.
>
> John attended the rural school district last year. When he entered the district, he had already been identified as learning disabled by the urban school district. His special education teacher knew John as a student by the time John was assigned to work with her 2 hours a day. John's special education teacher and classroom teacher had known each other for years and exchanged information and support almost daily. The classroom teacher didn't hesitate to ask the principal, her old friend, to cover her class when she had to leave for a meeting with other school personnel about John's program.
>
> In the urban school district, John had the advantage of a greater number of specialists. He not only went to a special education teacher, he also had a speech teacher and "adaptive physical education." However, the teachers found it hard to speak with each other. Although the teachers wanted to work closely for John's benefit, it was only during the biannual meetings to prepare his IEP, that they could exchange information. The psychologist who had tested John didn't have time to meet with the classroom teacher or the special education teacher because of district demands to serve several schools. The classroom teacher hadn't been able to attend the IEP meeting because no one was available to cover her class. She never received a copy of the IEP and never modified curriculum requirements for John. In addition, the classroom teacher had the Herculean task of teaching a class with non-English-speaking children, from Vietnam and Iran, a physically handicapped child, some with "behavior problems," John, and what are called the "normal" children. In the group of "normal" children were several "gifted" students with parents employed by the local university. When it came time for the parent conference, the classroom teacher was at a loss: she was unfamiliar with the psychologist's testing results and had not integrated them into John's curriculum. John's parents, hardly on speaking terms with one another, both expressed disappointment with John's school progress. After the meeting John's mother made the decision to have a parent advocate to represent John's interests to the school district.
>
> While attending the rural school and living with his mother, stepfather, and stepbrothers, John would visit his father and his father's new wife on holidays. When he returned from these visits, school personnel noted that he was disruptive in class, was abusive to other children on the playground, and had a shorter attention span. Hearing of this behavior, John's father was convinced that the rural school district could not meet John's needs. John was tested intensively and frequently over a 4-year period by the school districts and by private psychologists. Testing often took place just as John was returning to one parent, at the times school personnel had observed were particularly disturbing. The testing results, not surprisingly, were inconsistent and contradictory.
>
> The court handling the parents' custody dispute assigned a school specialist to determine the ability of each school district to meet John's needs. On the basis of the specialist's recommendations, the court decided that John should remain with his mother and attend the rural school district.

John's story is presented to illustrate that learning disabilities can be so dependent on the dynamics of school organization and the family that they can be nearly impossible to evaluate properly and to program effectively. School personnel, for example, were well intentioned, well trained, and hard working, but were not always able to teach John properly given the difficulties of the school setting. Their social and organizational context profoundly limited the full use of their expertise. Yet, as the situation became more complex, fragmented, and adversarial, more and more experts were called in. The rural school district lacked the expertise of special education personnel, but was seen by the court as meeting John's needs more fully, perhaps in part because the context in which the school personnel worked was a relatively integrated, smaller community.

Given the confusing, discontinuous, and stressful aspects of John's family and school lives, it stands to reason that he would have a difficult time learning. Perhaps another child with the same learning strengths and weaknesses might have met with far more school success if the school and family contexts in which the difficulties appeared were less stressful and more supportive.

The Social Context

The breakdown of social cohesion is seen in the fragmenting American family as well as in the withdrawal of Federal and State support from the public domain.

Isolation as a Handicapping Disorder

The modern social context is, to a great extent, the context of stress. Although we are accustomed to descriptions of our plight, we continue as creators and victims of environmental hazards, dangerous social settings, the shrinking family unit, drug abuse, alcoholism, and divorce. The media, the arts, and the social and biological sciences all in their own way provide daily chronicles of these phenomena in our culture.

Dependable and meaningful social connections—probably the most important technology available—are becoming increasingly rare. As one of myriad examples, the family breakfast, once a sociological given, is now fast becoming a period piece. The lives of children are often speedy and discontinuous. Moreover, those attempting to support, teach, or cure children suffer from the same social pressures that the children do.

The breakdown of the extended family (210) means the parents of a handicapped child cannot rely on continual support from relatives (120). Instead, they must often face problems alone or with anyone who might be seen as sympathetic or trustworthy.

Within the family, when family roles are rigid—what anthropologist Jules Henry has called "role segregated" (99)— the wife's activity and investment might consist only of housekeeping and childcare and the husband's only of breadwinning. This domestic specialization has been described as sometimes so strict that neither wife nor husband can emotionally support each other.

The well-being of family members may also be seriously threatened by work that is emotionally exhausting, financially insecure, or less than stimulating. Being harmed by the workplace makes it less likely that one can return home to make contributions of energy and good spirits to the rest of the family (215).

Isolation may occur in many regions of modern life. The families of handicapped children might suffer some isolation, possibly compounded by feelings of shame. Not only may the child who has learning problems be viewed with less esteem, the parents capabilities as caretakers may also be brought into question (120). Parents themselves may also question their own competence.

The isolation of families of the handicapped often leads to emotional strain and exhaustion, less effective relationships with the handicapped child as the strain continues, maintaining the child close to home, and being seen as outsiders by others (120).

The Shifting Federal Stance on Education

Providing equal opportunity for the poor, racial and cultural minorities, and the handicapped has been the stance of the Federal Government from the mid-1960's to the present. Efforts for equal opportunity have focused on the creation and support of programs for the disadvantaged, the handicapped, and the needy to receive fair treatment from educational agencies and on the enforcement of laws and rulings of the Supreme Court about discrimination based on sex, race, and national origin. Continuing Federal commitment for equal opportunity, however, is now questioned daily in the media.

Harold Howell II, a former vice president of the Carnegie Foundation, recently wrote that two important features of Federal funding for the disadvantaged will soon be seriously compromised. Title 1 of the Elementary and Secondary Education Act will soon be "unrecognizable." Block grants for education, earmarked for no groups in particular, will result in the "use of Federal education funds primarily to relieve State and local taxpayers." Also changing is the system of student aid programs for colleges and universities (104).

The U.S. Department of Education, formed only a few years ago, might be discontinued. The Secretary of Education, Terrel Bell, at one time announced that he will preside over the dismantling of the department.

The shift to the private sector for education can be seen clearly in California where the voucher system is on the horizon. This system would award tuition grants to pay for schooling in the private sector. Debate over the voucher system has understandably involved concern over the demise of the public school system, regarded by many as central to a democracy.

Learning Disabilities as Diagnostic Signs for the Health of Society

What can be said about the health of support systems, formal and informal, if "invisible" handicaps, which many learning disabilities are, can profoundly affect self-image, school success, and employment? For those in the middle and upper-middle strata, a learning disability may mean low self-image, a sense of isolation, and some difficulties related to school and career. For those in the lower socioeconomic strata, a learning disability may have far more handicapping power and may contribute to delinquency, unemployment, and imprisonment. Many of the people with learning disabilities, regardless of their social or economic status, live in the cracks in some sense, hoping that their "stupidity" will not be revealed.

Given all this, can one say that the disability lies solely within the individual? Perhaps this interpretation itself represents a disability. If the social response to learning disabilities is somehow imperfect, how? Do we simply lack adequate technology? It is interesting to note that learning disabilities are only recognized in cultures of high technological development. Preindustrialized or low-technology cultures don't seem to "have" learning disabilities. One legitimate question is thus: Is there something about highly technological cultures that provides fertile ground for learning disabilities to develop?

Redefining Learning Disabilities

Learning disabilities are redefined here as a social construct as well as a possible physiological fact.

Social and Emotional Aspects of Defining Learning Disabilities

Learning disabilities are handicaps that, as their name indicates, take more than one form. Individuals identified as learning disabled have a wide variety of profiles. Some of these disabilities might be primarily neurological, others primarily "ecological." The quality of family, school, and community life often determines to what extent a learning disability will have a disabling effect.

A young girl of 7 is having trouble learning to read. She confuses the letter *b* with *d*, the letter *p* with *q*, and the letter *p* with *g*. She is a bright child and converses with a good vocabulary and much expressive detail. Identified at an early age, she is receiving help from an experienced learning disabilities specialist. The prognosis is excellent, not only because she is receiving appropriate help early, but also because of integrated social supports: the parents are both present and agree about the nature of the difficulty, the school is small, and the teachers are specialists. The family has lived in the same neighborhood for years and relatives are nearby and willing to help out.

Another 7-year-old girl has no visual confusions but has trouble at times understanding what her teacher says or understanding the content of what she reads. It seems that her problems in learning language are entwined with a good deal of anxiety. This child's parents are recently divorced. The father believes that it is just a matter of the child realizing that she must do things for herself; she must try harder. The mother is concerned that the father pressures the child. The teachers at school agree that the child needs not only a program for her learning disability, but psychotherapy as well. The parents can't agree to provide for either. Her prognosis, understandably, is not as optimistic as that for the first girl.

The descriptions of learning disabilities vary in part because of such different social contexts. The definition of learning disabilities is a social construct as well as a biological and educational one. In speaking of mental retardation, Sarason and Doris write (181): "As a social or scientific concept, mental retardation has undergone dramatic change and there is every reason to believe that the process will continue." Sarason's social history of mental retardation suggests that the definition has "varied as a function of time, place and society."

The function of defining a handicap is not only to recognize a group of people who are different from the majority, but to justify social action with regard to them (181). Over time, our view changes of what social action is appropriate. The definition of learning disabilities as a handicap based on neurological dysfunctions may, in turn, shape our response to them. One may well be less frustrated or angry with a student, for example, if one believes he is not learning because of a problem he has no control over. If, on the other hand, one believes that it is a problem of "motivation," one might attempt to change the child's behavior rather than accommodate to it.

Clinicians and teachers have long noted, although it is not commonly discussed in the literature, that parents are often relieved that their child has a learning disability. Knowing a physical problem may relieve them of the worry of being the cause. School personnel might also feel the weight of accountability lifted. Medicalizing an educational problem in this way also can be seen as imparting to learning disabilities specialists the status of working in a medically related field. Thus, there are social reinforcements for viewing learning disabilities as neurological phenomena rather than as a reflection of our time, place, and culture.

Edwin Schur in *The Politics of Deviance* (187) notes that "collective definitions" of deviant states have a developmental cycle of their own. Part of this "developmental process" is the discovery or invention of a new deviance category. "This is not to say," he states, "that such a new definition has literally created the problematic behavior itself," but rather that the new "collective characterization has extremely important consequences." As an example of this process, Schur notes the "discovery of hyperkinesis."

The redefining of learning disabilities recognizes that part of what we are describing, along with problems in learning, is our social view.

Disabling Settings: School Services for the Learning-Disabled Population

The legal fiat to mainstream the handicapped has placed a considerable burden on classroom teachers who are faced with highly heterogeneous student groups without appropriate training or ongoing support from special education personnel.

The population of the mainstream is changing: two decades of social action and legislation have provided access to the mainstream for racial and cultural minorities as well as for the handicapped. The definition of the mainstream must change, and with it, the understanding of what it is that the diverse population can share.

Disabling Settings

The nature of some learning disabilities is such that symptoms can seemingly appear and disappear in different situations. In situations of high stress, it is not uncommon for profound regressions in reading and writing to occur. Supportive settings tend to enable learning-disabled individuals to use their learning strengths to compensate.

Some initial research, reported in Part One of this case study, indicates that mainstreaming might overwhelm some handicapped students. Other studies indicate that the legal guidelines for complying with Public Law 94-142, with regard to mainstreaming, identification, and program implementation, have resulted in considerable stress among school personnel.

The demands of teaching a highly heterogeneous population in an integrated classroom may well be a disabling setting for teachers. The "least restrictive setting" for the handicapped student, as defined by the school district, may be the most restrictive setting for good teaching.

The word "mainstreaming" does not appear in Public Law 94-142. The word used is "integration." Although these words are commonly interpreted interchangeably in practice, mainstreaming does not necessarily integrate the learning disabled into the current classroom life. Although such students are physically included in regular classrooms, as long as these classrooms are organized around reading and writing these students may not be truly "mainstreamed."

In addition, school services are organized around the learning weaknesses of the learning disabled, problems in reading or spelling or whatever is elevated to provide definitional power over the entire person. Learning-disabled students, by definition "normal" in all other respects, might also be gifted. Thus, recognizing their learning handicaps might mask the recognition and development of a broad range of talents, skills, and sensitivities.

Out of the Mainstream: Handicapped Teachers

Along with stressful work situations, school personnel often have to deal with isolation. Studies of the implementation of Public Law 94-142 indicate that classroom teachers have frequently not received the training necessary to teach handicapped children in the regular classroom. Some school psychologists have been described as seeing their jobs as finished when the testing report on a handicapped child is written. Their expertise is needed to train and support the classroom teacher, who has now become, in many cases, the person primarily responsible for teaching the handicapped. The school psychologist, however, is also often handicapped by too many referrals.

One factor that could be said to contribute to students' learning disabilities is the handicapping of those who work with them. Stressful work situations for teachers can undermine effective programs for students. Without considering how the workplace can handicap teachers, one might make the common error of believing that the problem can be adequately addressed with more teacher training, more new materials, more specialists, and more hard technology.

Fragmentation of the Interdisciplinary IEP Team

The requirements for an interdisciplinary assessment team as outlined by Public Law 94-142 assume that administrators, special education specialists, classroom teachers, and psychologists will be able to coordinate their efforts to evaluate and program for the learning disabled. The literature of the field describes the "overlapping jurisdictions" of specialists (95) and teachers confusions about their roles.

There might be sufficient expertise in the schools to identify and teach the handicapped. Nevertheless, this expertise in and of itself may not be sufficient to teach the handicapped successfully. The relations among those working in the schools have not been addressed by the legislation and not accorded sufficient importance in the literature.

A recent unpublished study is thus of note: an investigation of IEP's for learning-disabled children indicates that the effectiveness of these plans depends on the "harmoniousness" of the working relations among the professionals on the IEP team. In addition, effective IEPs took into account the teacher's needs as well as the student's. Three to four hours seemed necessary for the team to come up with a plan for the learning-disabled child (129).

Just as physical placement in the regular classroom presents only potential rather than certain integration, the fiat for "interdisciplinary" teams for evaluation and planning doesn't ensure that disciplinary boundaries allow exchanging information and offer support. In addition, legislation cannot ensure the cooperation of the family.

Unfortunately, one cannot legislate for harmonious working relationships. Nor can one legislate for the amount of time or quality of thought required for transforming a set of test scores into an appropriate plan for learning. No amount of funds will ensure quality of thought, performance, or willingness to cooperate.

The Changing Nature of the Mainstream

A growing number of students are not having their needs met by the public schools (71). This unfortunate situation appears related to the fact that the population of public schools is increasingly heterogeneous. The Bureau of Education for the Handicapped estimates that there are 8 million handicapped school children in this country. In addition, 35 percent of the black population and

47 percent of the Hispanic population is below the age of 18, while only 27 percent of the white population are. There is a movement toward the private sector providing education—a movement that the Reagan administration appears to support.

One can no longer assume that the great majority of public school students have racial or even cultural similarities. The movement for universal access to public education supported by both Democratic and Republican administrations since the 1960's has changed the public school community. Who is the mainstream and what are the common needs of this increasingly diverse population? It is not surprising that a recent article on American high schools in *The New York Times* reports that there is a growing sense that the organizing principles of high schools must be changed (71).

Public Schools Out of the Mainstream

The New York Times article on high schools also states that high school students are isolated from other institutions of the community (71). The National Commission on Resources for Youth is quoted in a 1974 report as claiming that "in earlier periods, the home, the local community, and the place of employment furnished a variety of opportunities for youth to work, to make helpful contributions to family and community and to associate in other ways with adults. This situation has changed" (71).

Schools are being pushed out of the American mainstream in yet another sense. The effect of the baby boom was seen in the public schools in the 1940's through 1960's. Throughout, communities prided themselves on their commitment to high-quality public education. These babies grew up, married late, divorced, or didn't marry at all. The birth rate dropped and, with it, the tax base to support public education. Antitax measures along with a diminished birth rate have led, according to the National Center for Educational Statistics, to the closing of 9,868 schools between 1968 and 1977. In the last 12 years, the public school population dropped 9.8 percent, and it is projected to drop further before reaching a plateau in the middle of the 1980's (33).

Treatment and Intervention: Systems With Learning Problems

One of the longstanding theories in the field states that learning disabilities stem from a lack of integration between the hemispheres of the brain. This lack of integration also seems to describe the system of treatment and intervention for learning-disabled individuals in this country. The outcome is that the system—not in communication or supportive relation with itself— cannot learn effectively.

Lack of Communication and Support Within the Treatment and Intervention System

The current literature on learning disabilities abounds with examples of components of the system not working in concert. Parents of handicapped children are described as isolated (120), the social movement for services for the learning disabled is described as out of step with scientific investigation (8), researchers identify certain children as learning disabled while school districts do not (200), handicapped children are described as socially isolated (108), researchers are described as out of touch with practitioners (130), professional organizations are described as divided and adversarial (130), the specialists evaluating and prescribing for a given learning-handicapped child fail to communicate (114), and decisionmaking in model programs for the learning disabled is variable and inconsistent (199). These are only some examples.

The failure to integrate Federal legislation and State propositions has severely compromised services for the handicapped. The accountability of the public schools to serve the handicapped has been dramatically increased by Public Law 94-142, while, at the same time, financial support for the schools has been severely cut. Massachusetts and California voted to cut property taxes, traditionally the financial basis of public education. Proposition 2½ in Massachusetts, in addition to cutting local property taxes by 2.5 percent of the market value, eliminates a local school board's ability to determine its own budget. Massachusetts provides an excellent example of the lack of integration in approaching the handicapped: while on the one hand the State undercut the financial bases of the schools with Proposition 2½, it also pioneered a model of special education services in 1972 with the enactment of Chapter 766. Many important aspects of Public Law 94-142 were patterned after Chapter 766 (131).

Many school districts face rising accountability and diminishing budgets. In addition, future legislation requiring increased accountability is likely. Assembly bill 2286 in California, for example, establishes that local education agencies must pay for the attorney of the party representing the handicapped child if the local education agency also employs an attorney to present its own case.

It could be said, then, that the system does not function as a well-coordinated unit. The great numbers of well-trained, well-intentioned people do not add up to a well-working whole. There seems to be no shared method toward accomplishing this end. The system consists of a tangle of institutions, dogmas, regulations, legislation, disciplines, professionals, and parents as well as the learning disabled themselves. Fragmentation not only characterizes the system, but also each of its parts. The identification, treatment, and intervention processes all share this attribute.

One could safely guess that, given fragmentation is great, communication within the system is far less than what it could be. Another way of saying this is that the system is not in communication with itself. Schon (185) offers this comment on services for the blind:

> The system will not learn what to do unless it becomes more capable of learning; it will not act on the basis of its learning unless it is made to do so with forces which are commensurate with its own resistance to change.

The "problem" and the "solution" are, in the words of Schur, ". . . little more than two ways of describing a single interwoven set of facts" (187).

For these reasons, the system of schools, researchers, professionals, and agencies can be seen as a "learning disordered" system.

Official, Indirect, and Informal Intervention Systems

In a classic study of a social service system Schon (185) describes the "official," "indirect," and "informal" systems of services for the blind. Using Schon's analysis, the official service system for learning disabilities would encompass the following areas:

- education (Federal, State, and local, both public and private);
- mental health (same);
- vocational rehabilitation (mostly Federal and State);
- training of professionals (Federal, State, or private);
- research (supported by public and private funds); and
- interest groups of professionals and parents (private).

The "indirect" service system for learning disabilities includes the security and benefits of agencies dealing with social security, welfare, health, etc. The "informal" service system consists of the benefits and services provided by families, friends, and community members. As in Schon's analysis of the "system for the blind," one could probably state with confidence that the informal system, although impossible to describe in terms of financial cost, may be the largest system of all. Practical wisdom also suggests that the effectiveness of services provided by the official and indirect systems may depend on the integrity of the informal system. For example, a child from a disintegrating family, without social supports, might be treated for a learning disability without being able to take advantage of that treatment.

DIRECTIONS: TECHNOLOGICAL POSSIBILITIES TO "MAINSTREAM" THE SYSTEM

The development and use of technologies should be informed by the distinct nature of learning disabilities. Hard technology can be seen as speaking to certain aspects of a learning handicap; for example, a learning-disabled student might learn best with electronic multisensory instruction. Soft technology refers to aspects of the complex social context in which the hard technology exists. A possibility concerning soft technology might be the creation of programs for teacher training and support that enhance the effective use of school-based microcomputers (hard technology). The fragmented service system can be seen as seriously compromising the potential contribution of hard technology. Thus the possibilities below include possible soft technological approaches that may determine the effective use of hard technology.

Develop Complementary Hard and Soft Technologies for Those With the "Indistinct Handicap"

Because learning disabilities are most often identified in individuals who are physically, emotionally, and intellectually within the "normal" range, the learning disabled are excellent candidates for self-help programs. The understanding many have developed of how to compensate with social and other skills can be used in developing soft technologies to support others with silent handicaps.

The "symptoms" of learning disabilities appear or disappear depending on the setting. A mismatch of setting and learning style is often interpreted as a learning disability, as well it may be. It is important to note that teaching approaches can be modified to enable the learning-handicapped student to learn much more effectively. Other modifications that can be made to match learning styles include choice of appropriate materials, shortened work periods, small student groups, and regular checking-in periods with the teacher during the day. Restructuring settings—both their requirements and their supports—can mean that a learning disability is far less of a learning problem.

Because the learning profiles of the learning disabled show both strengths and weaknesses, hard technologies can be used to supplement native strengths insofar as they can exploit this range of abilities, talents, and interests. Those with visual-motor difficulties might use typewriters, tape recorders, or voice-activated word processors. Electronic advances, providing a wealth of alternatives to the written word, might not only make it easier for those with visual-perceptual problems, but may eventually make certain learning disabilities far less handicapping. They could be used to tailor information input and output to individual learning styles.

Task analysis, a method used in the field of learning disabilities for evaluation and program design, is a highly valuable soft technology. It is a tool for determining learning styles. One observes the learner in a series of systematically sequenced tasks to determine learning strengths and weaknesses and their interrelations. The idea is that learning strengths can be used to compensate for learning weaknesses. One learning style might be described as follows: visual-perceptual confusion tends to be compensated for by using strong verbal language skills and by saying the letters of confusing words aloud.

With the knowledge of a person's learning style, one can make informed choices about the use of both hard and soft technologies. Because everyone has learning strengths and weaknesses, task analysis is a soft technology appropriate for the heterogeneous classroom. Students could be grouped according to learning styles and academic needs. A program using task analysis integrated with a systems approach to educational setting, personality, and community was attempted in California (29).

"Mainstream" Classroom Teachers

With the radical change in the population of the "regular" classroom, classroom teachers find themselves in stressful situations every day. Their training has been primarily for "regular" education, based on the assumption that only certain types of "normative" problems might appear. Previously, children with problems had been referred "out," and specialists outside the classroom had often been responsible for them.

As Sarason (181) points out, classroom teachers and special education teachers traditionally were separated in training as well as in educational agencies. It had been assumed that the two student populations they serve were so different that integrating special and regular education was inappropriate.

With the passage of Public Law 94-142, the regular classroom teacher faces children requiring special education. Often, the classroom teachers are the central "deliverers" of the program delineated by the IEP. Yet they are still not centrally involved in diagnosis and planning, even though they are often the ones who have the most information about students and that gathered in a range of situations over a long time.

The generalist—the classroom teacher—is now required to be the specialist. The accountability of the job has increased immeasurably, just as the accountability of the school districts has increased. And, like the school districts, the classroom teacher often does not have the proper support or preparation to do the job.

The stress, the fatigue, and possibly the guilt of attempting a demanding job without adequate support or preparation appears to have had an isolating effect on classroom teachers. They are less likely to share information, more likely to feel that, because they are failing, they must hide the nature of their performance (not unlike learning-disabled students). Clinical experience tells us that being in situations in which one continually experiences failure weakens ties to others who might be of help.

Soft technologies in the schools could focus in part on "mainstreaming" the classroom teacher. The isolation of the classroom teacher can be ameliorated by taking actions like the following: 1) ensuring that the classroom teacher is present at IEP meetings, 2) setting up specific and regular times for specialists and classroom teachers to discuss the programs of children, 3) providing in service training for the highly heterogeneous classroom, and 4) delineating job boundaries clearly. In addition, hard technologies like microcomputers can be used to help the classroom teacher individualize programs for a range of learning needs as well as reduce the time spent in paperwork.

"Mainstream" School Systems

One can make an educated guess that classroom teachers are not the only isolated people in the system that provides services for the learning-disabled population. The school system itself is also fragmented. Administrators—the personnel who are central to creating soft technologies for "mainstreaming" classroom teachers—must also be "mainstreamed." They also are overwhelmed, overaccountable, and possibly plagued by self-doubt. Parents, observing overworked teachers or feeling disappointed by the unmet promise of the new legislation, often feel alienated from schools.

The effectiveness of hard technologies, new programs, and professional expertise are often seriously compromised by aspects of organizational life. Cowan (52) describes a case in which a school administration's failure to communicate with school principals first affected the commitment of the principals to a "new math" program and eventually the success of both a teacher and a student in the new program. The new math program was introduced by the principals to their schools with little investment. Teachers, feeling compelled to cooperate, agreed to spend 6 weeks of their summer in a new math training program. One of the teachers who least wanted to take part in the program was later faced with a number of students who needed more direction than the new teaching method provided. One of these students began to misbehave after weeks of not being able to grasp the new material. The child was referred to the school psychologist for a possible learning deficit and a recommendation was made that the child enter therapy to "remove the emotional block to his learning."

This example illustrates not only that a learning problem might be based in the interaction between child and educational setting, but also that expertise can be misapplied in certain contexts, and that an educational innovation can be rendered ineffective by administrative mismanagement. It is common for experts to be disabled by certain forms of administrative leadership and decisionmaking. The quality of organizational life is often the most hidden and pernicious handicapping force on schools and service agencies and should inform the choices for technology development and use.

The isolation of the system's constituents is especially clear in IEP meetings. In these, parents often disagree with school personnel and with each other. The interdisciplinary evaluation teams are better described as multidisciplinary: each specialist gives a report, and the results of the reports remain unintegrated. The opinion of the classroom teacher may not be given sufficient weight. Often, with no one available to cover the class, the classroom teacher is not even present. Yet the IEP meeting is the only time that all the people planning the educational program of the learning-disabled child have a chance to meet.

School personnel with the same jobs could meet in small groups. Consultants with training in group processes could participate in the formation of these groups. The consultants could not routinely attend the groups, but serve as consultants to any given group when asked. The groups would of course not be therapy groups, but rather support groups in the work setting. After some time, horizontal connections could be made by forming groups of administrators, teachers, and special personnel. The purpose of these groups is not training, but to provide support and a meaningful context to the workplace.

Not a support group primarily, Project TECH (Training in Education Cooperation for the Handicapped) is a program of school personnel and parents to encourage cooperation in program evaluation and planning. Project TECH is part of the Special Education Resource Network, California Office of Special Education. Teams of parents and personnel from local school districts are trained in 3-day workshops and return to their communities to train others. This is a good example of community-based soft technology that addresses the relationships of people and interests in the system for the handicapped (38).

Integrate Various Services for the Learning Disabled

The learning disabled suffer problems not only in school learning. The anecdotes about learning-disabled adults provide powerful testimony of the range of these difficulties. If such adults manage to circumvent the prejudice of potential employers, as workers they may be plagued by "accident proneness," difficulties in reading charts and maps, mishearing directions, or slowness in completing tasks. Often these adults maintain patterns of dependency begun with parents and peers. Not being able to read makes one far more dependent, and not only in completing school tasks. Other tasks, such as finding a job, navigating through large buildings with titles on walls and doors, finding an apartment, or taking information over the phone, can also be overwhelming.

Case managers are needed to coordinate and integrate the contributions of specialists like remedial tutors, vocational rehabilitation counselors, and psychotherapists. Just as important, case managers can help the learning disabled to enter into community activities by using services and programs for the general population. Activities that recognize and develop the talents and interests of the learning disabled are as important or more important than services that speak only to their limitations.

The abilities of these individuals can be combined with the abilities of others through team structures, using the group to compensate for the weaknesses of individual members. In the novel *More Than Human*, Theodore Sturgeon describes a group of disabled children who find each other and create a working group by using their complementary strengths and weaknesses (197). This is also a kind of mix-and-match soft technology: matching person and person, person and setting, and person and task.

In his analysis of the service system for blind people, Schon (185) suggests "new models of integrated service" that would coordinate services relating directly to the handicap itself and those relating to health, employment, recreation, or financial support.

Different forms of integrated services are necessary for different learning-disabled people, for their range of profiles is wide. Some learning problems may be primarily neurological, others primarily emotional. These different profiles mean that there must be separate but similar and often overlapping, service systems.

Schon suggests that "all forms of integration would require the establishment and management of networks of service—that is, linked arrays of agencies." Greater attention would be given to activities that mark the crossing of boundaries, such as those related to admissions, screening, and referral. "Tracking" individuals through the system, ideally with the help of coordinated computer use throughout the agencies, would show what agencies were meeting what needs. The leadership in this system would largely provide feedback about the states of the system, which would help the system self-regulate.

Establish Communication Between Researchers and Practitioners

One of the characteristics of the system for the learning disabled is that what is considered of dubious value by researchers is often considered best practice by practitioners. An example, school practitioners' apparent unawareness of a decade of research seriously questioning the "perceptual hypothesis." This hypothesis, which assumes the existence of underlying perceptual abilities, is the basis of much diagnosis and planning for learning-disabled students. Additional training may be necessary but not sufficient to close this gap between researchers and practitioners. It is more likely that ongoing work groups of researchers and practitioners supported by State and Federal agencies or private foundations would establish effective channels of communication.

Consider Developing New Organizing Principles for the Schools

As long as "mainstreamed" classrooms are organized around the written word, "mainstreamed" students will not be truly integrated. This is very likely true, regardless of whether these students are the learning disabled or non-English-speaking Chicanos, Chinese, or Vietnamese. As a greater percentage of students in the "mainstream" can't read, one must question the wisdom of using reading as the focal point of classrooms. The idea behind "mainstreaming" is harmonious with democratic principles: minorities and the handicapped should learn in the same social communities as "regular" children. Because social development is central to "mainstreaming," the basis for "mainstreamed" classrooms should be something the children do actually share—whatever that may be. Academic instruction should take place in small groups, organized by learning levels, styles, and needs.

Consider the Contributions of Learning-Disabled People

When we want to see the future, we often go to experts. An alternative method is to go to those who represent more marginal regions of the culture. Their perspectives are sometimes those of the mainstream to come. The learning disabled, many of whom have learned to survive successfully, to establish their own networks, and to have full lives without knowing how to decode the written word, may well be the source of ideas for future developments.

Rapid advances in technology often dictate policy rather than the reverse. Yet, if we look to the life experiences of learning-disabled people in schools and beyond, they may provide guides for using technologies that are both effective and humane.

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